Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 13, Issue 3, 2013
PRINT ISSN 2284-7995, E-ISSN 2285-3952

STUDY ON THE PRESENCE OF ANTIBIOTIC RESIDUES IN HONEY INTENDED FOR PUBLIC CONSUMPTION

Radiana TAMBA-BEREHOIU[1], Diana M. VISOVAN[1], Ciprian–Nicolae POPA[2]

[1]University of Agricultural Sciences and Veterinary Medicine, Faculty of Biotehnologies, 59 Marasti, sector 1, 011464, Bucharest, Romania, Phone: +40 21 318 25 64/232,
Fax: + 40 21318 28 88, E-mail: radianatamba@yahoo.com, margelusha@yahoo.com
[2] FARINSAN S.A. Gradistea, Comana, Giurgiu district, cipnpopa@yahoo.com

Corresponding author: radianatamba@yahoo.com

Abstract

The purpose of this paper is to highlight the presence of antibiotic residues in honey sold for human consumption. Specific objectives relates to the determination of residues of streptomycin, tetracycline and erythromycin in 18 samples of different types of honey, such as: acacia honey, linden honey and polyfloral honey. Honey was purchased from Bacau County, in 2012, from the following localities: Moineşti, Onesti and Bacău. Antibiotic residues were determined with the RIA - Charm II test. The results revealed the existence of streptomycin residues in all samples of analyzed honey, above the permissible limits (40 ppb), except linden honey samples from Bacău. Tetracycline residues were found in all samples, the limits were exceeded only for acacia honey from Moineşti and linden honey from Oneşti. Erythromycin residues have not exceeded the limits admitted to any sample, but they showed great variability. In conclusion, at the county level, all types of honey often contain residues of antibiotics, although European rules on consumer safety forbid adding them for prevention. The danger of toxicity is evidenced by the existence of several types of antibiotics in the same batch of honey, regardless of their concentration, due to their potential synergistic effect.

Key words**:** *antibiotics, honey, residues*

INTRODUCTION

The honey bee has earned the reputation of a „healthy" product for its beneficial properties in food area, medicine, cosmetic industry. Honey is a delicious source of carbohydrates, it is easy to digest, providing quick energy [2, 3, 6, 7]. The main types of honey are: monofloral honey, polyfloral honey and forest honey [5].
Examination of honey is done for: appreciation of quality and purity, state of degradation or adulteration, forgery detection. Examination of honey consists in senzory analysis and specific laboratory tests which must comply with quality and food safety. For this it is necessary to verify compliance with the limits of some toxic substances, set by the European Union, including antibiotics [1]. Contaminating honey antibiotics (streptomycin, tetracycline, erythromycin etc.) are used excessively in the practice of beekeeping in order to combat / prevent a disease or as stimulators [10].
Antibiotic residues in honey are banned in our country, because it can create over time a particular organism resistance to this kind of drugs [12]. In addition to antibiotic resistance, clinical studies have associated a number of disorders (irritation, dermatitis, anemia, fetal malformations etc.) with the presence of antibiotic residues in products for public consumption [9, 11].
The purpose of this study is to determine by laboratory methods antibiotic residues in different types of honey for public consumption in 2012. Specific objectives: analysis of the residue of streptomycin, tetracycline and erythromycin in samples of acacia, linden and polyfloral honey, also a toxicological evaluation of differences, on antibiotic content, between categories of analyzed honey and areas in which they were purchased.

MATERIALS AND METHODS

Control of bee products is regulated worldwide by FAO Committee/O.M.S. Authorized organizations have established maximum limits for residues of antibiotics in

honey intended for public consumption. In Romania, drug residues and maximum quantities allowed in food are subject to EC Directive EWG 2377/90, as amended in 2002 by Directive EG 1752/2002 [4, 8]. Table 1 notes max permissible limits of antibiotics in honey.

Table 1. Maximum limits of antibiotics in honey (ppb) *(F.A.O/ OMS, European Honey Directive of the European Honey Commission)*

Analysed parameter	EU Standard (European Honey Directive of the European Honey Commission)	International Standard (Codex Alindenntarius Standard of F.A.O. / O.M.S Commission)
Chloramphenicol	Absent	Absent
Nitrofuran	Absent	Absent
Streptomycin	**Absent / allowed (40)**	**Absent / allowed (40)**
Tetracycline	**Absent / allowed (20)**	**Absent / allowed (20)**
Sulphonamides	Absent / allowed (10)	Absent / allowed (10)
Erythromycin	**Absent / allowed (20)**	**Absent / allowed (20)**
Penicillin V	Absent	Absent
Penicillin G	Absent	Absent
Oxacillin	Absent	Absent
Ampicillin	Absent	Absent
Ciprofloxacin	Absent	Absent

For the analysis were taken the following samples of honey: in December 2012 were purchased from retail trade units from 3 localities of the County of Bacău (**Bacău, Moineşti, Oneşti**), a number of six (6) jars of honey, **acacia honey**, **linden honey** and **polyfloral honey**, in order to determine the concentrations of antibiotics. From each bottle was taken a sample, resulting **18 (3 x 6) samples** that were introduced in the analysis for each type of honey. Antibiotic residues were analyzed in the laboratory of residues SVL Bacău (State Veterinary Laboratory), which belongs to Sanitary-Veterinary and Food Safety Direction of Bacau.

Determination of antibiotic residues in honey is done using RIA test-Charm. The procedure establishes how to carry out the determination of residues of streptomycin, tetracycline and erythromycin in honey. During the procedure, were followed the guidelines established by the laboratory "Working Protocol - II Charm Streptomycin Test for Honey, Charm II Macrolide Test for Honey, Charm II Tetracycline Test for Honey".

RESULTS AND DISCUSSIONS

Antibiotic residues found in honey from Bacău county (Moineşti, Onesti, Bacău) and county average are presented in Table 2.

Table 2. Antibiotic residues in honey analyzed in Bacău county (ppb)

Antibiotic	**Locality**	$\overline{X} \pm s_{\bar{x}}$	**CV%**
Acacia			
Streptomycin	Bacău	**57,00**±6,72	11,8
	Moinesti	**54,00**±0,14	27,34
	Onesti	**41,66**±13,66	**32,78**
	Bacău County	**50,88**	-
Tetracycline	Bacău	17,50±2,88	16,49
	Moinesti	**20,17**±3,18	15,81
	Onesti	14,16±3,76	26,56
	Bacău County	17,27	-
Erythromycin	Bacău	0,33±0,15	**45,94**
	Moinesti	0,23±0,05	24,89
	Onesti	0,25±0,00	-
	Bacău County	0,27	-
Linden			
Streptomycin	Bacău	32,50±10,83	**33,35**
	Moinesti	**48,33**±8,75	18,11
	Onesti	**47,50**±8,21	17,29
	Bacău County	**42,77**	-
Tetracycline	Bacău	15.00±5,47	**36,51**
	Moinesti	19,83±2,71	13,68
	Onesti	**20,16**±2,56	12,70
	Bacău County	18,33	-
Erythromycin	Bacău	0,25±0,07	28,28
	Moinesti	0,10±0,00	-
	Onesti	-	-
	Bacău County	0,11	-
Polyfloral			
Streptomycin	Bacău	**57,83±**2,22	3,85
	Moinesti	**45,83**±13,19	28,79
	Onesti	**50,83**± 14,63	28,78
	Bacău County	**51,49**	-
Tetracycline	Bacău	10,66±3,32	31,18
	Moinesti	16,83±1,47	8,74
	Onesti	12,16±3,48	28,66
	Bacău County	13,21	-
Erythromycin	Bacău	-	-
	Moinesti	0,20±0,00	-
	Onesti	-	-
	Bacău County	0,06	-

Streptomycin concentration exceeded the permissible limits in all types of honey and in all places, except linden honey purchased

from Bacau. Streptomycin county averages in all types of honey have been raised above the permissible limits. The coefficients of variability, with few exceptions, were also large, proving that additions of antibiotics are chaotic and without respecting sanitary regulations.

Regarding **tetracycline**, the average values are below the limit of legislation at all types of honey, except acacia honey from Moineşti and linden honey from Onesti, which averages slightly exceeded the limit. The average county values comply with the law.

The average values of **erythromycin** have not exceeded the limits allowed, in any type of honey, regardless of the location from which honey was purchased. Similarly, the average county falls within limits.

Figure 1 shows a comparative differences observed in average antibiotic concentrations, between acacia honey purchased from: Bacău, Moineşti and Oneşti and county average.

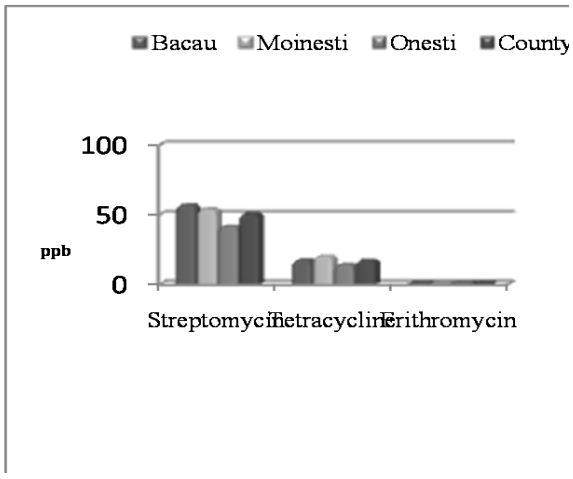

Fig. 1. The average values of antibiotics in acacia honey from different locations compared to the average county

From the above figure it is observed that streptomycin contaminates all lots of acacia honey that were analyzed from the localities. Erythromycin and tetracycline are not, apparently, a danger of contamination of honey, any local or county level. The danger of toxicity is evidenced by the existence of several antibiotics in the same batch, regardless of their concentration, due to their potential synergistic effect. Also, by repeated ingestion of honey contaminated with three types of antibiotics, in time, the human body can reach a certain type of resistance, and when it becomes necessary to use an antibiotic, the body no longer responds to treatment.

Figure 2 shows a comparative differences observed in average antibiotic concentrations, between linden honey purchased from: Bacău, Moineşti and Oneşti and county average.

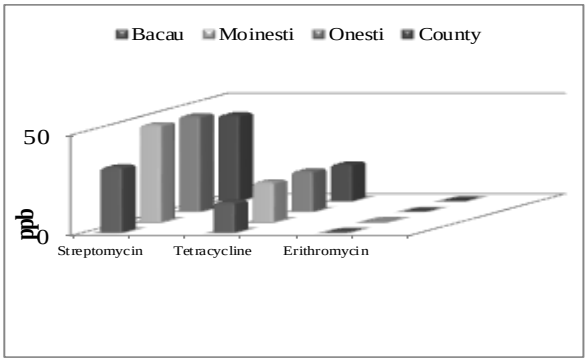

Fig. 2. The average values of antibiotics in linden honey from different locations compared to the average county

From the above figure it is observed that streptomycin contaminates all lots of linden honey that were analysed, in localities and at the level of the county. Tetracycline does not endanger the county, although locally (Oneşti 20,16 ppb) there is a small excess of maximum limits. Erythromycin is the only antibiotic that apparently is not a danger of contamination for honey, no local or county level.

Figure 3 shows a comparative differences observed in average antibiotic concentrations, between polyfloral honey purchased from: Bacău, Moineşti and Oneşti and county average.

From figure 3 we observed that streptomycin contaminates all groups of polyfloral honey that was analysed in localities and county level. Tetracycline and erythromycin are no danger of contamination for honey, no local or county level. The danger of toxicity is evidenced by the existence of several antibiotics in the same groups of honey. The

use of antibiotics help beekeepers in the treatment of disease and prevention, so as to avoid getting sick, they frequently use antibiotics, in order to ensure that the production of honey will be bigger.

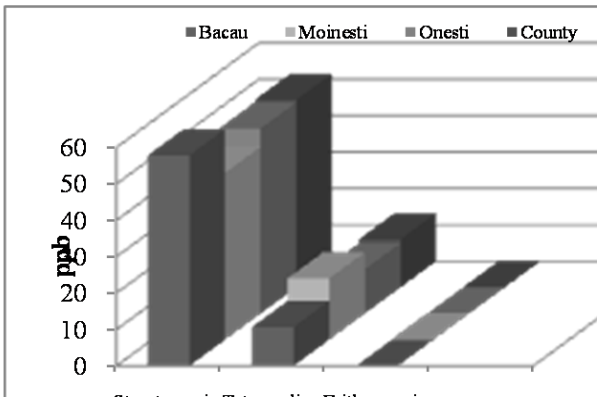

Fig. 3. The average values of antibiotics in polyfloral honey from different locations compared to the average county

CONCLUSIONS

The average values of **streptomycin** residues have exceeded the maximum permissible limits (40 ppb) in all types of honey (acacia, linden, polyfloral) purchased from localities Moineşti, Oneşti and Bacău, as well as at the level of the county;

Tetracycline residues were detected in all types of honey purchased from Moineşti, Oneşti and Bacău, but their average value exceeded the permissible limit (20 ppb) only for acacia honey (20,16 ppb) from Moineşti and linden honey (20,16 ppb) from Oneşti;

Erythromycin residues were below the permissible limits, at all three types of honey and in all places in which honey was purchased;

It appears that in all the county the honey production, regardless of range (acacia, linden or polyfloral), contains **residues of antibiotics**.

The results of the study show clearly that although in our country it is currently forbidden to use streptomycin, beekeepers have added antibiotics (mainly streptomycin) in sugar syrup used in stimulate feeding from the spring, either to prevent the occurrence of diseases in bees, either to stimulate the queen.

The danger of toxicity is evidenced by the existence of several antibiotics in the same batch of honey, regardless of their concentration, due to their potential synergistic effect. Also, through repeated ingestion of honey contaminated with three types of antibiotics, in time the human body can reach a certain type of resistance to them. Although there are rules that determine the allowable limits of antibiotics in honey, these are not respected, which is why the honey exports from Romania to the EU fell due to abusive use of antibiotics.

REFERENCES

[1]Băzgan O., 1999, Diagnostic de laborator şi igiena alimentelor de origine animală, Editura Moldogrup, Iaşi;
[2]Dabija P., Harnaj A., 1968, Producerea mierii pe secţiuni, Editura Apimondia, Bucureşti;
[3]Frisch, 1934, 1965, citat de Winston, 1993, Cartea stuparului, Editura Agro-Silvică, Bucureşti;
[4]Grecu I., Curea E., 1980, Identificarea substanţelor medicamentoase, Editura Dacia, Cluj-Napoca;
[5]Lampeitl F., 2002, Albinăritul pentru începători, Editura Mast, Bucureşti;
[6]Mărghitaş L. A., 2007, Albinele şi produsele lor, Editura Ceres;
[7]Mârza E., Popa A., 1966, Cartea apicultorului, Editura Agro-Silvică, Bucureşti;
[8]Näumann G., Mahrt E., Himmelreich A., Mohring A., Frerichs H., 2012, Traces of contamination–well preserved in honey, Journal für Verbraucherschutz und Lebensmittelsicherheit, Volume 7;
[9]Sánchez-Brunete C., Albero B., Miguel E., Tadeo J. L.,2005, Rapid Method for Determination of Chloramphenicol Residues in Honey Using Gas Chromatography-Mass Spectrometry, Department of Environment, National Institute for Agriculture and Food Research and Technology (INIA), Spain;
[10]Sapna J., Nimisha J., 2010, Antibiotic Residues in Honey, CSE India;
[11]Slebioda M., Barganska Z., Namiesnik J., 2011, Determination of antibiotic residues in honey, Trends in Analytical Chemistry , Vol. 30, No.7;
[12]***www.sciencedirect.com