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10.2478/msd-2019-0016

ROMANIAN MILK – PCBS AND PESTICIDES ACCUMULATION

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ABSTRACT: Regarding the raise of the human living level to a growing extend of agro-food products, especially of animal origin, this research was carried out to investigate and compare the PCBs (ng/g of fat) and pesticides parameters (α – HCH, β-HCH, δ-HCH, Aldrin, Dieldrin, Endrin, DDE, DDD, DDT and Endosulfan) of cow milk samples of four different areas around Sibiu, Romania. The milk samples were collected two month from different farmers.

Results showed that minimum content of PCB and pesticides were observed at samples collected from Rasinari area, indicate that in mountain area cows are the most favorable animal breeding.

KEY WORDS: milk, PCBs, organochlorine pesticides, GC-MS

1. INTRODUCTION

The genetic revolution of food has not yet revealed its true effect on consumer health, so European Union standards on pesticide limitations in food are rather drastic (Oros 2005).

Polychlorinated biphenyls and other similar compounds are synthetic oils and have been used for industrial purposes since 1929 in the US, their discovery being considered a scientific miracle due to their special features in operation (Kegley 2007).

They have been used in the manufacture of transformers, capacitors, paints, plastics, foil, ink, lip gloss.

Since 1976, their manufacture has been forbidden in the US and later in other countries after discovering the negative impact on health and the environment. However, polychlorinated biphenyls already contaminated the planet. Food technology specialists are of the opinion that the phenomenon of globalization is the main cause of the spread and massive use of pesticides and PCBs (Covaci et al 2001).

Research has shown that very small amounts of pesticides and PCBs are extremely damaging. Due to their specific physicochemical properties, PCBs have been extensively used in various industries, both in closed applications and systems, as well as in open applications (Nag 2008)

In Romania, there is currently no adequate control of pesticide products or synthetic fertilizers used in the food composition. These products have the role of destroying the raw material pests and contributing to the growth of crops. Thus, pesticides are used in a wide range and in enormous quantities, not taking into account the amount of propellant to be administered or the mode of use.

Another reason for concern is that, due to the illegal producers, in Romania there are tons of extremely dangerous pesticides that have already been banned within the European Union, being classified as chemical waste. Accumulations of pesticides in milk have also been identified in China, Pakistan or Ethiopia, the values being often below the permitted limit (0,2 μg / kg-15,6 μg / kg), (Abou et al., 2010, Bai et al., 2006, Gebremichael et al., 2013, Muhammad et al., 2012, Ul Hassan et al., 2014). Also on identification and quantification of pesticides and milk residues were focused in Brazil, Greece Santos et al., Shahzadi et al., 2013, Kampire et al., 2011, Daly et al. 2005, Tsiplakou et al., 2010. The obtained results have shown that where pesticides have been used inappropriately in agriculture, milk values have increased.

2. MATERIAL AND METHODS

Economic conjuncture and current human relationships have led to a complete breakdown of human beings and human communities from direct food sources, so that milk has also created circuits or branches involving many actors: raw milk producers, collectors and transporters, product processors, distributors and retailers, and last but not least consumers. All these are important links in the quality management of raw milk from producers to consumers (Tadeo 2008).Considering the importance of this stage in milk quality management, the aim of the research is to analyze and evaluate the studied holdings, harvesting, processing and analyzing samples of milk collected in terms of milk quality indicators - PCBS and pesticides, as well as the processing of the results.

We aim to identify the risks that may arise in raw milk sources so that we can formulate some conclusions and recommendations of this research on the quality of raw milk, the beginning of quality management for any food.

The research contained in this work on the quality level of raw milk from the manufacturer has been aimed at addressing the following objectives:

- analysis of the main PCBs defining the overall quality of milk;
- analyzing and evaluating the content of pesticides in raw milk;
- analyzing, evaluating and managing the risks of milk quality;
- Developing some recommendations to improve and respect the quality of raw cow's milk and to protect the health of consumers.

The area of interest is represented by the county of Sibiu, through the towns of Rasinari, Sadu (the two are located in the mountainous area), Avrig and Medias.

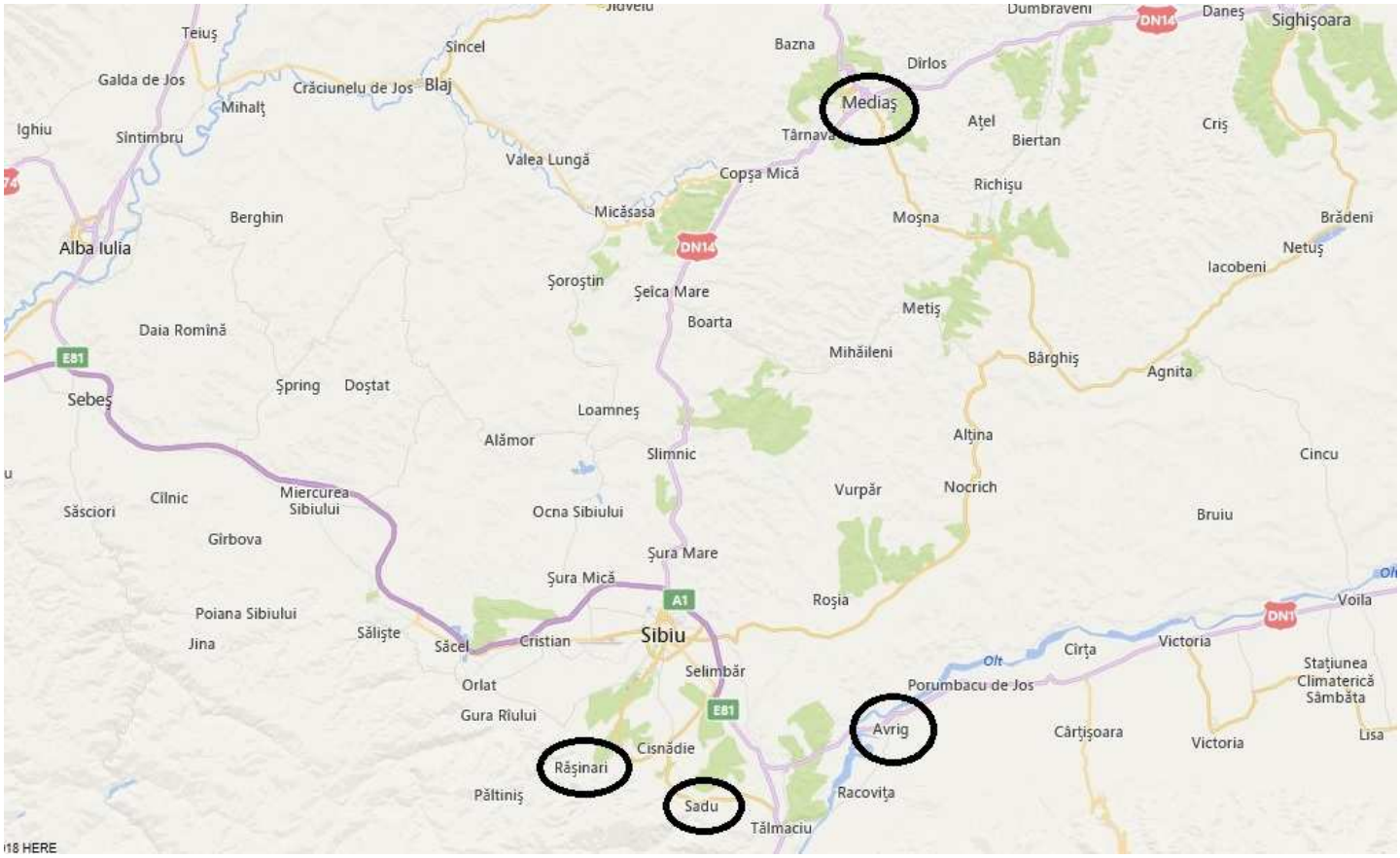


Figure 3. Points of samples collection

Each milk sample was analyzed on the basis of two parameters: PCBS (28, 52, 101, 138, 153, 180, 194) and pesticide levels (α-HCH, β-HCH, δHCH, Aldrin, Dieldrin, Endrin, DDE, DDD, DDT, Endosulfan). These parameters highlight first of all the technological quality of the product and, last but not least, the hygienic and sanitary quality of milk health.

PCBs and organochlorine pesticides were determined using the GC-MS instrument (Varian 450-GC coupled with a Varian 240-MS external ionization ion trap MS). The individual PCBs and pesticides standards were purchased from LGS Germany. Acetonitrile, acetone, ethyl acetate, n-hexane, dichloromethane and sodium chloride were purchased from Merck (Darmstandt, Germany), anhydrous sodium sulphate from Sigma Aldrich. Purified water was used (TKA Smart2Pure system, Germany).

Chromatographic separation was performed using a CP-Sil 8 CB column (50 m x 0.25 mm x 0.25 µm, Agilent). The oven temperature started at 60°C (maintained for 5 minutes) and continued by increasing to 280°C (at a rate of 20°C / min.) Injector and detector temperatures were maintained at 240°C and 270°C, respectively. The temperature of the mass spectrometer ion source was maintained at 210 °C. 2 mL of each sample was used for injection.

3. RESULTS AND DISCUSSION

The study by Bai et al. 2006, in China, considers that the use of organochlorine pesticides in agriculture and control leads to a high incidence of HCH and DDT residues in tested food samples.

In this study were analyzed a number of 4 samples in double. The raw material milk was processed on four points of economic interest regarding the reception of raw milk by the collectors (Rasinari, Sadu, Avrig and Medias) on the basis of PCBs and pesticides.

Following the analysis of the results obtained from the 4 units studied, it is constant that the amount of waste is minimal in the mountainous area, especially in the area of Sadu and Rasinari. The mountainous area is an area exploited in a biological system beneficial to human health, also supported by Daly in 2005 in the paper "Organic contaminants in mountain". In all samples found PCBs.

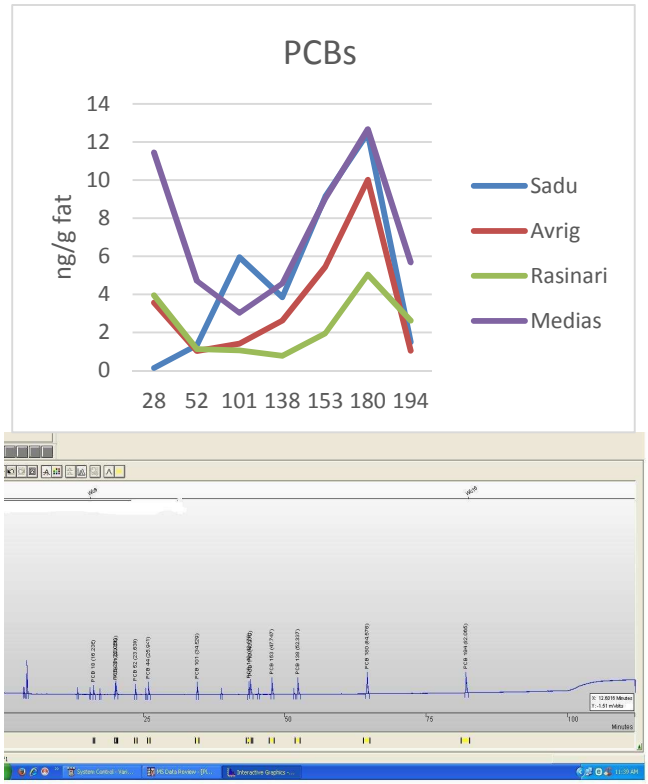
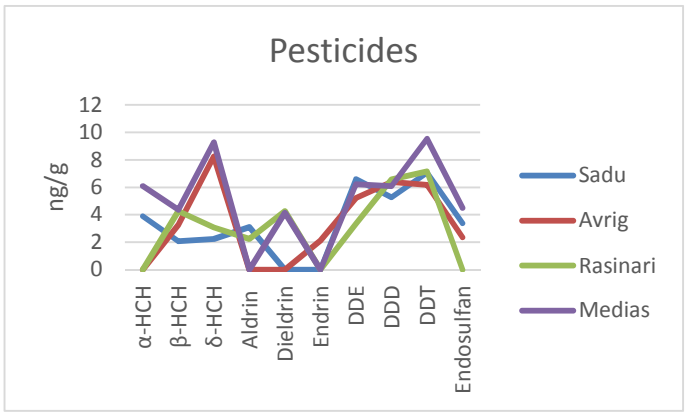


Figure 4. Identification and evolution of PCBs in milk samples

Following the analysis of the obtained results, it is established that the values identified SHALL NOT FALL WITHIN the values required by the national legislation on PCBs.



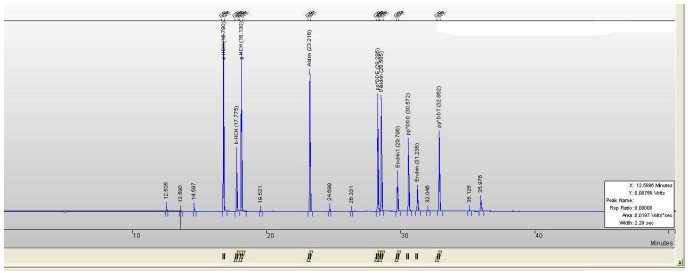


Figure 5. Identification and evolution of pesticides in milk samples

Selected sources have also highlighted the presence of pesticides. Based on the analysis of the results obtained from the 4 units under study it is constant that the unit in the Medias area recorded the highest level.

4. CONCLUSIONS

One of the important objectives of food security for human communities is to ensure that individuals have unrestricted access to a balanced, qualitative and quantitative food supply and, last but not least, healthy food (Rotaru and Mihaiu 2007). I believe that it is appropriate to check the incidence of contamination with PCBs and pesticides in milk to focus on geographical areas in order to be able to track the possible concentration of residues.

Following the milk quality assessment for the PCBs and pesticides indicators on the four types of farms surveyed, we are able to highlight some conclusions and recommendations.

As a result of our research and experience, we recommend the use in GC determinations of complex type standards developed by specialists in the field, as well as their periodic re-injection if working conditions change.

The results obtained lead us to a clear recommendation that it would be useful to address the maximum admissible concentration values for PCBs and pesticide residues at each separate milk sample as the difference in fat content between them is considerable.

We also recommend the nomination of maximum permissible limits for these contaminants separately in the "recommended baby products" category, as is the case with other chemical contaminants. Foods of animal and plant nature are considered to be sources of organochlorine pesticide contamination.

We also recommend analyzing the pesticide content of complex feeds in order to detect the true source of contamination.

As a final conclusion, I believe that the number of milk samples tested in national programs for the determination of PCBs and pesticides should be much higher but based on the fat content.

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