AACL BIOFLUX

Aquaculture, Aquarium, Conservation & Legislation International Journal of the Bioflux Society

Determination of organochlorine pesticides and total PCB in aquatic ecosystems of Cluj county

I. Valentin Petrescu-Mag^{1,2,3}, Benone Păsărin¹, Gabriel Hoha¹, Ruxandra M. Petrescu-Mag^{1,4}

¹Ion Ionescu de la Brad University of Agricultural Sciences and Veterinary Medicine Iași, Romania; ²SC Bioflux SRL, Cluj-Napoca, Romania; ³University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Romania; ⁴Babes-Bolyai University, Faculty of Environmental Sciences and Engineering, Cluj-Napoca, Romania.

Corresponding author: I. V. Petrescu-Mag, zoobiomag2004@yahoo.com

Abstract. In the present study, fat tissues of small cyprinid fish was sampled from Cluj-Napoca and Cluj surrounding areas (N-W of Romania), urban and peri-urban waters, and used to determine the organochlorine and total polychlorinated biphenyls (PCB) concentrations of aquatic environments. Results indicated a very low concentration or even the absence of some organochlorine pesticides and PCB, as follows: DDT and metabolites 0.005, Aldrin 0.001, Dieldrin 0.000, Endrin 0.000, Hexachlorbenzen 0.002, Heptachlor 0.001, α -HCH=0.000, β -HCH=0.000, γ -HCH=0.007, δ -HCH=0.000, total PCB=0.000. Such low concentrations of pollutants found in fish fat are explained by decreased agricultural and industrial exploitation in Romania, banning the use of some dangerous chemicals in agriculture, short generation time of fish and its low position in the trophic chain. **Key Words**: agricultural exploitation, industrial, pesticides, concentration, aquatic ecosystems.

Summary. Endocrine disruptors (ED) are exogenous substances that interfere with the synthesis, secretion, transport, binding, action, or elimination of natural hormones in the body that are responsible for the maintenance of homeostasis, reproduction, development, and/or behavior (Georgescu et al 2005; Petrescu-Mag et al 2010; Păunescu et al 2011; Sandor et al 2012). They are sometimes also referred to as hormonally active agents, endocrine disrupting chemicals, or endocrine disrupting compounds. Organochlorine pesticides and total polychlorinated biphenyls are among the most important ED (Fleşeriu 2010).

In the present study, fat tissues of small cyprinid fish was sampled from Cluj county (N-W Romania), urban and peri-urban waters, and used to determine the organochlorine and PCB concentrations of aquatic environments. Twenty different sampling places were selected, including both rivers and lakes; ten sampling places were situated in Cluj-Napoca (mostly industrial) and ten from Cluj-Napoca surrounding areas (mainly agricultural), as follows: Someş (from entering the river in the city), one sample; Someş (central zone of the city), two samples; Someş (on leaving the river in the city) one sample; Cartier Intre Lacuri – irrigation canals, three samples; Cartier Intre Lacuri – Lake II, one sample; Lake Gheorgheni I – one sample; Lake Chios, one sample; Gilău, one sample; Luna de Sus, one sample; Floreşti, one sample; Apahida, one sample; Jucu de Mijloc, one sample; Jucu, one sample; Lakes from Câmpeneşti, three samples; Mărtineşti (nearby Aiton), one sample.

The organochlorine pollutants were determined by GC-ECD, using a Perkin Elmer GC-MS. Results indicated a very low concentration or even the absence of some organochlorine pesticides and PCB (see Table 1). Their level proven to be much lower than maximum admisible levels according to EU legislation. The pollutants were identified in fat tissues of fish in 0-35% of samples analyzed.

Such low concentrations of pollutants in fish fat compared to results observed in other animals, in mammals for instance (Georgescu et al 2011), and compared to other countries, are explained by decreased agricultural exploitation in Romania, banning the

use of some dangerous chemicals in agriculture wide world, short generation time of fish and its low position in the trophic pyramid.

Level of organochlorine pollutants and total PCB in fish fat sampled from Cluj county and surrounding areas, Romania

Table 1

Compounds	Sample size	Mean level mg/kg (ppm)
DDT and metabolites	20	0.005
Aldrin	20	0.001
Dieldrin	20	0.000
Endrin	20	0.000
Hexachlorbenzene	20	0.002
Heptachlor	20	0.001
a-HCH	20	0.000
β-HCH	20	0.000
γ-HCH (lindan)	20	0.007
δ-ΗCΗ	20	0.000
Total PCB (mixture)	20	0.000

Acknowledgements. This work was cofinanced from the European Social Fund through Sectorial Operational Programme Human Resources Development 2007-2013, project number POSDRU/I.89/1.5/S62371 "Postdoctoral School in Agriculture and Veterinary Medicine Area". Secondary, it was supported by the project 590/13.09.2012 (National Plan II, Capacities - Bilateral Cooperation between Romania and Wallonia).

References

- Fleşeriu A., 2010 Endocrine disrupting pesticides and their impact on wildlife and human health. HVM Bioflux 2(1):1-4.
- Georgescu B., Georgescu C., Coşier V, Mierliţa D., Mag I. V., 2005 Pesticides with endocrine disrupting activities: description and screening strategies. Bulletin of the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca Animal Science and Biotechnology 61: 184-187.
- Georgescu B., Georgescu C., Dărăban S., Mihăiescu T., 2011 Assessment of persistant organic pollutants acting as endocrine disruptor chemicals in animal fat, cow milk and lacteous sub-products from Cluj County, Romania. ABAH Bioflux 3(1):1-9.
- Păunescu A., Ponepal C. M., Marinescu G., 2011 Lung toxicity induced by the action of champion 50wp fungicide in marsh frog (*Pelophylax ridibundus*). Studia Universitatis Vasile Goldiş Seria Ştiinţele Vieţii 21(2):355-360.
- Petrescu-Mag I. V., Păsărin B., Todoran C. F., 2010 Metallurgical, agricultural and other industrial related chemical pollutants: biomonitoring and best model organisms used. Metalurgia International 15(Sp.Issue 9): 38-48.
- Sandor Z. J., Papp Z. G., Kosaros T. J., Hegedus R., Csenger I., 2012 Potential effects of pharmaceuticals and their residues in aquatic environment. Studia Universitatis Vasile Goldiş Seria Ştiinţele Vieţii 22(2):247-255.

Received: 20 October 2012. Accepted: 09 November 2012. Published online: 25 November 2012. Authors:

Ioan Valentin Petrescu-Mag, Ion Ionescu de la Brad University of Agricultural Sciences and Veterinary Medicine Iași, Mihail Sadoveanu Alley 8, 700489 Iași, Romania, European Union, e-mail: zoobiomag2004@yahoo.com Benone Păsărin, Ion Ionescu de la Brad University of Agricultural Sciences and Veterinary Medicine Iași, Mihail Sadoveanu Alley 8, 700489 Iași, Romania European Union, e-mail: pbeno@univagro-iasi.ro

Gabriel Hoha, Ion Ionescu de la Brad University of Agricultural Sciences and Veterinary Medicine Iași, Mihail Sadoveanu Alley 8, 700489 Iași, Romania, European Union, e-mail: gabihoha@yahoo.com

Ruxandra Mălina Petrescu-Mag, Ion Ionescu de la Brad University of Agricultural Sciences and Veterinary Medicine Iași, Mihail Sadoveanu Alley 8, 700489 Iași, Romania, European Union, e-mail: pmalina2000@yahoo.com

This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

How to cite this article:

Petrescu-Mag I. V., Păsărin B., Hoha G., Petrescu-Mag R. M., 2013 Determination of organochlorine pesticides and total PCB in aquatic ecosystems of Cluj county. AACL Bioflux 6(2):82-83.