ORGANOCHLORINE PESTICIDES BIOACCUMULATION IN MOLLUSK TISSUE COLLECTED FROM THE BLACK SEA COAST

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ABSTRACT

Pollutants accumulation in organisms is a consequence of environment contamination. The latest data (2003 – 2004) regarding organochlorine pesticides bioaccumulation in mussels reveal a large range of compounds: HCB, lindane, heptachlor, aldrin, dieldrin, endrin, DDE, DDD, DDT, in concentrations between 4,65 ng/g wet tissue and 9 800 ng/g wet tissue. Among different mollusk species the highest value was identified in mussels (*Mytilus galloprovincialis*), their feeding by filtration increasing this process. It was notice also that the greatest organochlorine pesticides concentrations were detected in organisms collected from the north area (Sulina – Gura Buhaz) which is strongly influenced by Danube.

KEY WORDS : organochlorinated peticides, bioaccumulation, mollusks, Black Sea coast

INTRODUCTION

Marine organisms accumulate chemical pollutants in their tissues when the up-take processes from the environment are more active than the metabolic process or removal of this compounds from the body. This phenomena is called bioaccumulation and is defined as organism potential to accumulate pollutants in such concentrations which are bigger than those found in the environment (water, sediments, food).

Because of their filter-feeding characteristic, bivalves have a strong capacity to concentrate chemical pollutants in their body. This is why bivalves were used, since 1960, to monitor the contamination of marine environment with some pollutants, respectively persistent chemical pollutants.

MATERIAL AND METHODS

The biologic material was represented by marine mollusks: *Mytilus galloprovincialis, Mya arenaria, Rapana thomasiana, Scapharca inaequivalvis.*

Organochlorine pesticides analyses was done by gas-cromatography method using a Hewlett – Packard gas-cromatograph with electron capture detector.

Organism sample preparation was done as follow:

- Soxhlet extraction in hexane/dichloromethane (1/1) mixture 8 hours;
- Concentration up to 20 ml in a rotary evaporator;
- fractionation on florisil column;
- final concentration was done in Kuderna-Denish concentrators and in nitrogen stream up to 1 ml.

RESULTS AND DISCUSSIONS

The research done in 2003 on *Mytilus galloprovincialis* sampled from different locations along the romanian Black Sea coast revealed organochlorine pesticides concentrations between 0 and 3720 ng/g tissue (Fig. 1).

The highest concentrations were detected in 2 Mai and Costinesti locations, specially for lindane (3 720 ng/g tissue, respectively 3678 ng/g tissue), aldrin (1985 ng/g tissue, respectively 727,5 ng/g tissue), HCB (1146 ng/g tissue, respectively 1014,5 ng/g tissue) and endrin (1476 ng/g tissue, respectively 1353 ng/g tissue). There is no DDT or its metabolits (DDD and DDE).

The situation is different in 2004 (Fig. 2) when mussels sampled in similar locations (Costinesti) had levels much lower for some compounds (lindane from 3378 ng/g tissue to 571 ng/g tissue; HCB from 1146 ng/g tissue to 59,3 ng/g tissue; endrin from 1476 ng/g tissue to 35,6 ng/g tissue).

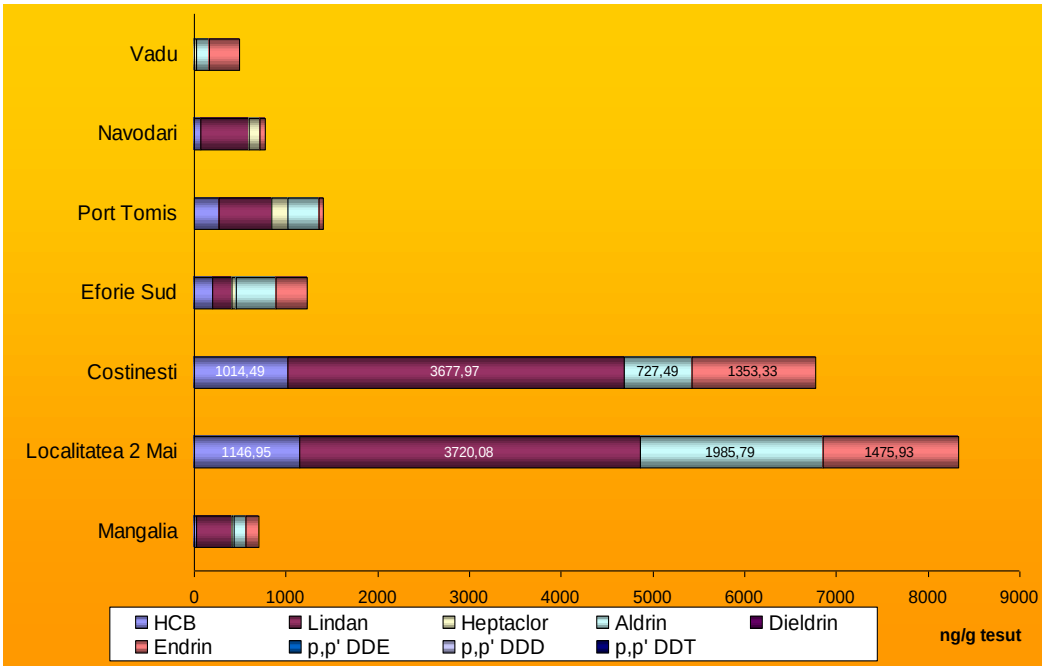

Fig. 1 - Organochlorine pesticides concentrations in *Mytilus galloprovincialis* collected from different locations along the Romanian Black Sea coast in 2003

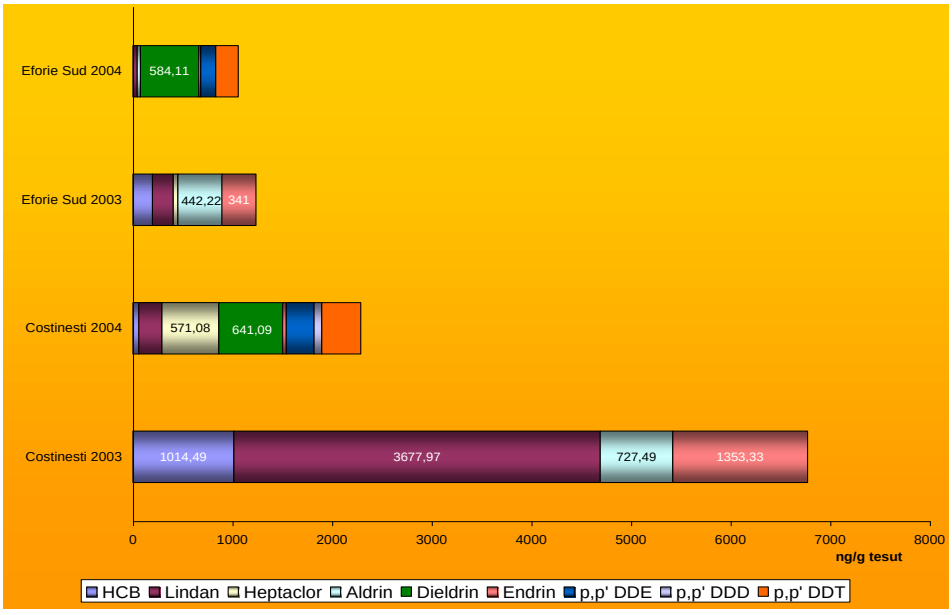

Fig. 2 – Comparative organochlorine pesticides concentrations in *Mytilus galloprovincialis* collected in 2003 and 2004

Data obtained in 2003 (Fig. 3) on *Mytilus galloprovincialis* and *Rapana thomasiana* from site Pescarie revealed organochlorine pesticides concentrations between 0 and 1453 ng/g tissue.

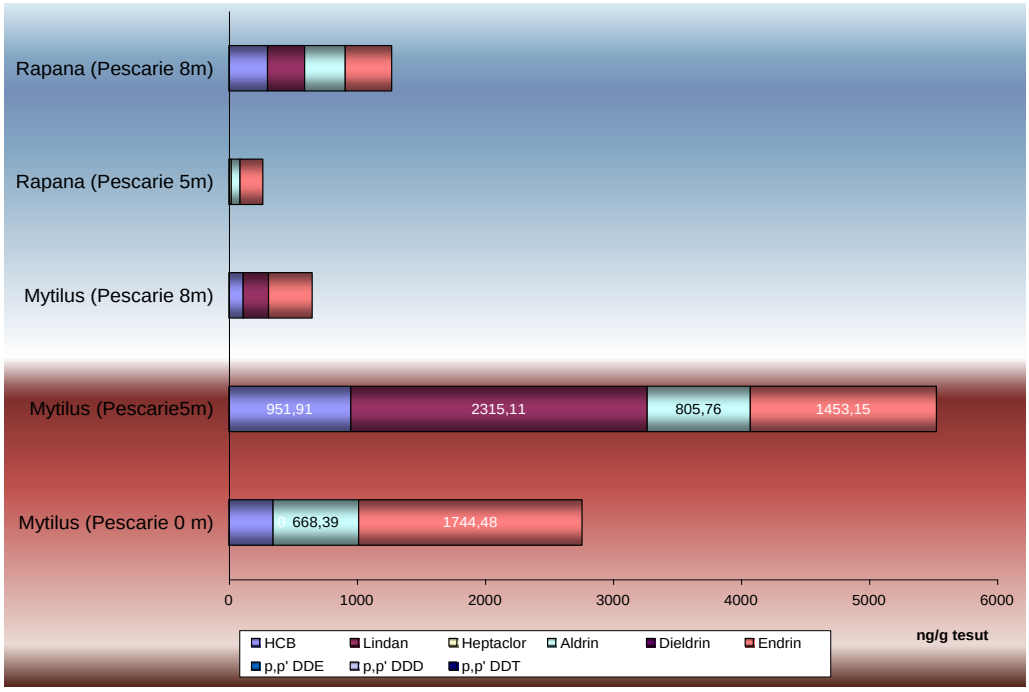

Fig. 3 - Comparative organochlorine pesticides concentrations in *Mytilus galloprovincialis* and *Rapana thomasiana* collected from Pescarie site in 2003

The highest concentration were detected in *Mytilus galloprovincialis* sampled from 0 and 5 m depth lines (endrin 1745 ng/g tissue, respectively 1453 ng/g tissue; aldrin 668 ng/g tissue, respectively 805,7 ng/g tissue; lindane 2315 ng/g tissue and HCB 952 ng/g tissue for organisms sampled at 5 m depth line). There is no endrin, DDT or its metabolits (DDD and DDE).

Data obtained in 2004 (Fig. 4) on different mollusks species sampled from the north part of the Romanian Black Sea coast which is under the Danube influence (Portita) showed concentrations between 0 and 98000 ng/g tissue.

The highest concentrations were detected in *Mytilus galloprovincialis* and *Rapana thomasiana*: 9800 ng/g tissue DDT in *Rapana thomasiana* and 9485 ng/g tissue lindane; 5835 ng/g tissue dieldrin; 2368 ng/g tissue DDE and 1195 ng/g tissue DDD in *Mytilus galloprovincialis*. The other compounds had concentrations up to 1000 ng/g tissue.

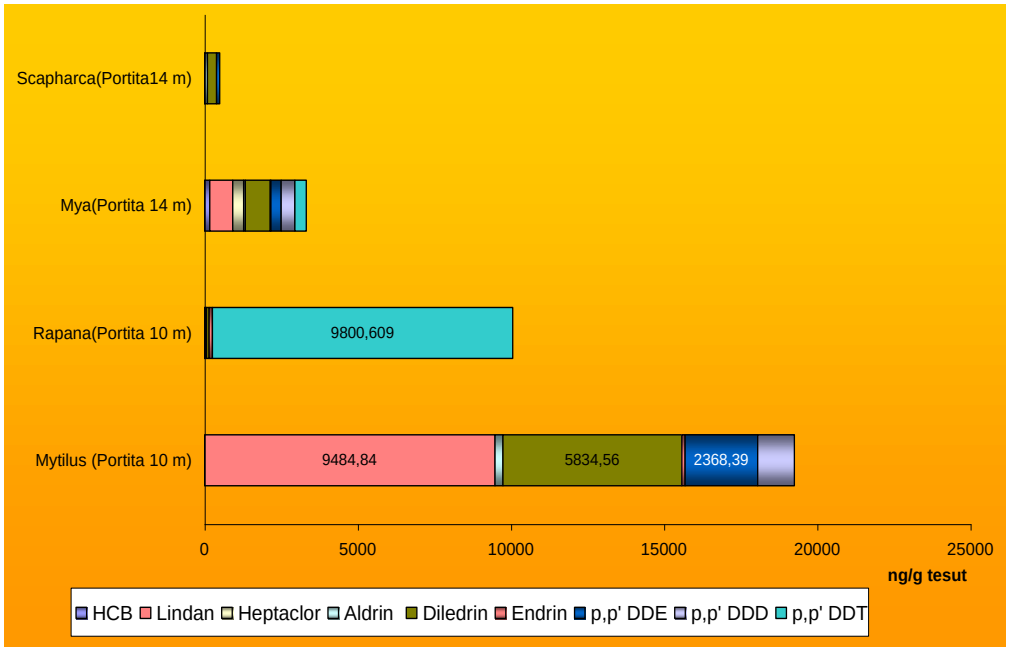

Fig. 4 - Comparative organochlorine pesticides concentrations in on different mollusks species from the north part of the Romanian Black Sea coast in 2004

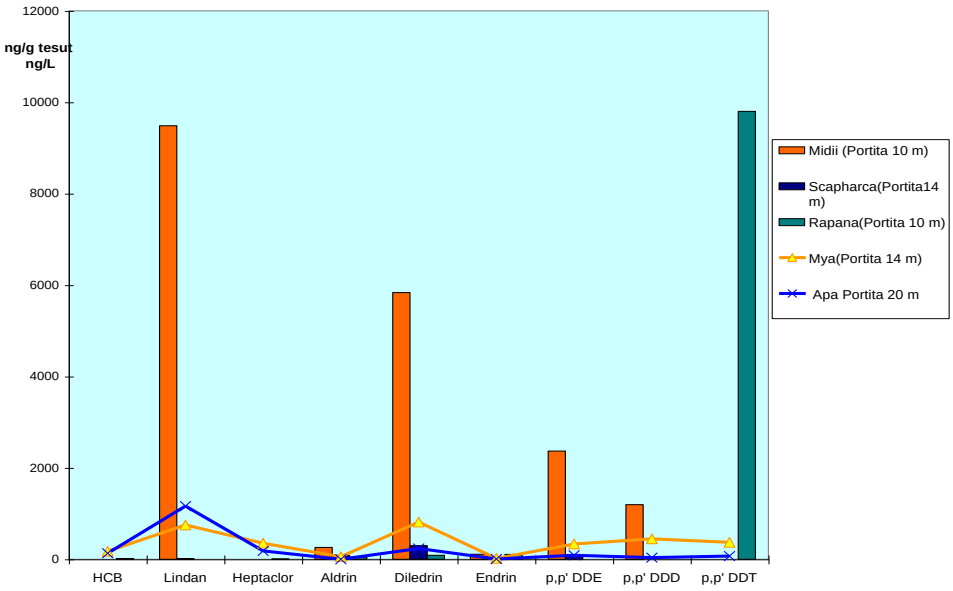

Fig. 5 - The correlation between organochlorine pesticides concentrations in water and molusks tissue

The comparison of the organochlorine pesticides concentrations in organisms tissue and in abiotic elements showed correlation between organochlorine pesticides concentrations in water and in the tissue of *Mytilus galloprovincialis* and *Mya arenaria* (Fig. 5). This correlation was not seen in the case of sediments (Fig. 6).

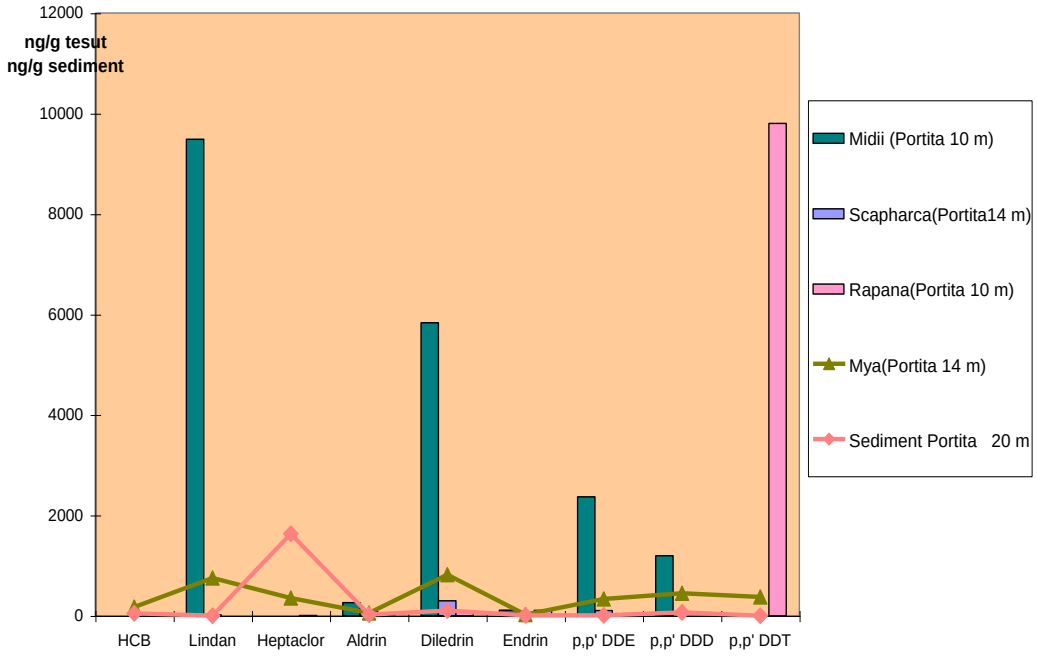

Fig. 6 - The correlation between organochlorine pesticides concentrations in sediments and mollusks tissue.

Comparing the concentrations of DDT and its metabolites found in mollusks from south, respectively north part of the Romanian Black Sea coast with date reported by some other authors (PORTE, ALBAIGES, 2002; PICER, 2000; EEA, 1999) at Mediterranean Sea and Adriatic Sea it can be seen (Fig. 7) that in the south part the concentrations are twice to third times lower than other parts in the world and in the north part they are ten times bigger than other parts in the world.

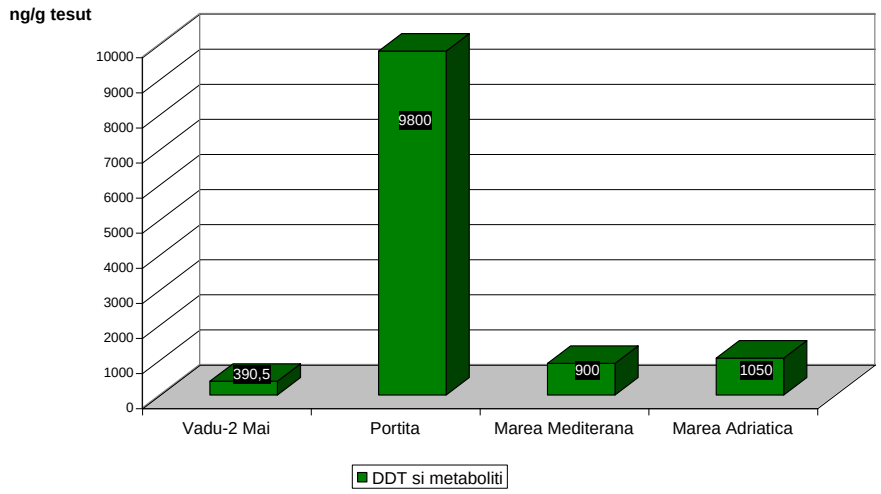

Fig. 7 - Comparative organochlorine pesticides concentrations in mollusks from south and north part of the Romanian Black Sea coast, Mediterranean Sea and Adriatic Sea

CONCLUSIONS

- The tissue levels of organochlorine pesticides in some mollusks from different parts of Romanian Black Sea coast varied from 0 to 9800 ng/g tissue. The highest concentrations were detected for lindane, dieldrin, DDT and its metabolits.
- Even there are extreme values like in organisms from the north area the main figures do not exceed 1500 ng/g tissue, which is below the limits allowed for see food consumption adopted in some European countries.
- In south area DDT and its metabolits concentrations are lower comparing with Mediterranean Sea and Adriatic Sea, but the situation is completely different in the north under the Danube influence.

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