

Organochloride pesticides transfer within the Danube Delta Ecosystem

Silvia Chitimiea, Carmen Toader, Liviu N. Popescu

National Institute of Research-Development for Environment Protection
Spl. Independentei nr. 294, sector 6, cod 77703, Bucharest 78, Romania
Phone: +40 1 221 5770, Fax +40 1 312 1393, Email: lipopesc@pcnet.pcnet.ro

Summary

During 1999, a complex research programme was focused on the Danube Delta Ecosystem, which is an enormous natural laboratory with intense physico-chemical and biological processes and an impressive number of organisms. Organochloride pesticides transfer (HCH and DDT) in various rings of the Danube Delta ecosystem chain (water, sediment, bivalves, fish and birds) was studied.

Introduction

Being the second biggest in Europe, the Danube Delta is a buffer zone through which substances collected by the Danube River are discharged in the Black Sea. The Romanian sector of Danube Delta has 3,446 km². Lakes cover more than 300 km² for the Delta surface, without considering small lakes (under 0.5 km²) and the lakes Razim-Sinoe. The necessity of a real ecological protection of this important ecosystem has led to the establishment, by Parliament Decision (Law 82/1993), of the Danube Delta Biosphere Reservation (DDBR) with a surface of 6,764.7 km² (including the lagoon zone Razim-Sinoe and marine buffer zone)¹ in 1993.

Sampling and analysis

Samples were taken in August-September. Sampling and analysis were done by GC-MS according to international standards and methods.^{2,3} Almost 50 fish were analysed, covering different dimensions and belonging to almost all species of Romanian fish (except trout).

Results and discussion⁴

See Table in Annex.

Conclusions

K_{sw} values are decreasing from entrance of Danube in Delta to discharges in Black Sea, from the middle to the north (for channels) and from the north-west to the south part of the Danube Delta. The biggest quantities of HCH are bioaccumulated in *Uniopictorum*, *Zender*, *Heron* and DDT is accumulated especially in *Dreissena*, *Carassius* and *Egret*.

K_{sw} values show that the DDT bioconcentration is bigger than for HCH, which suggest a longer persistence of DDT in sediment than HCH. The same situation was observed for DDT and HCH bioaccumulation in bivalves, which normally can have an explanation, by relatively sedentarity of bivalves and longer contact time with polluted water and sediment.

For DDT and HCH behaviour in fish and birds (which eat fish) the bioaccumulation is conversely. DDT is no longer used and the DDT values in water are almost nil which leads to very small bioaccumulation in biota. HCH is still used and its values in water are bigger which leads to higher bioaccumulation in fish and birds.

Considering fish as a source of food for human consumption, the HCH and DDT values in fish tissue are established by the maximum allowed limits in accordance with Food Quality Romanian Regulations of Health Ministry.

The quality of drinking water also takes into account the HCH and DDT presence being under the Romanian maximum allowed limits for tap water.

Annex - Table. Results of measurements

	No	Sampling point	Water µg/l		Biota-K _{sw} (*10 ³)		Biocenoses - BCF (*10 ³)					
					Sediment		Bivalves		Fish		Birds	
			ΣHCH	ΣDDT	ΣHCH	ΣDDT	ΣHCH	ΣDDT	ΣHCH	ΣDDT	ΣHCH	ΣDDT
Danube	1	Down.Ismail	0.047	0.113	1.68	8.85						
	2	Sulina	0.049	0.111	0.84	0.95			Salmon 0.049 0.09 Bream 0.016 0		Heron 1.56 0.65	
	3	Sfantu Gheorghe	0.069	0.082	0.79	1.84					Cormorant 0.64 0.07	
Channels	4	Lopatna	0.100	0.167	0.097	0.35						
	5	Litcov	0.076	0.074	1.04	3.20	TL 0.32 19.74					
	6	Crisan Caraorman	0.012	0.034	5.33	9.65	Uniopictorum 3.42 4.38 Dreissena 2.33 56.62				Egret 0.44 0.12	
Lakes	7	Rotundu	0.035	0.045	1.69	5.04						
	8	Somova	0.030	0.115	1.83	1.51			Carassius 16.33 0.35 Zender 20.67 0.09			
	9	Isacova	0.106	0.079	0.54	1.80			Carassius 2.78 0.49 Pike 4.97 0.70 Zender 4.64 0.28			
	10	Uzlina	0.151	0.071	0.62	1.28	TL 0.159 20.56 Uniopictorum 0.133 13.52					
	11	Razim-Bisericuta	0.122	0.163	0.17	0.10	Uniopictorum 0.189 4.92 Cignaea 0.14 0.69	Carassius 5.74 0.123 Zender 5.71 0.11				

References

1. Romanian Statistical Yearbook, National Commission for Statistics 1995
2. ISO -DIS 5667
3. ISO - DIS 6468
4. ICIM Studies 1999 (unpublished)