

Researches regarding contamination of soil with pesticides and their remanence

Mihaela Cazacu^{*}, C.I. Jianu, A. Riviș, G. Hegheduș-Mîndru,
Ramona Hegheduș-Mîndru, D.S. Ștef, G. Bujanță

Faculty of Food Processing Technology, Banat's University of Agricultural Sciences and Veterinary Medicine
"King Michael I of Romania" at Timișoara, Calea Aradului 119, RO-300645 Timișoara, Romania

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Abstract

The aim of this study was to detect the pesticide residues (Trifluralin, Metaclor and Prometrin) from soil and to estimate their remanence in soil at 7 respectively at 14 days after administration. The researches were performed over a period of one year. The samples were analyzed by (GC) gas chromatographic method. The obtained results showed that the most rapid degradation was recorded for Trifluralin which was found, after 14 days from the administration, at a concentration of 21% relative to the administered amount. It followed Metaclor with 56% out of initial dose. The smallest degradation rate was noticed for Prometryn which was refound in proportion of 60% after 14 days.

Keywords: pesticides, remanence, soil, Trifluralin, Prometrin

1. Introduction

Extensive use of pesticides in agriculture industry poses a serious threat to surroundings, domestic animals and public health [1]. The pesticides, once they are in the soil, in addition to their effect on diseases, pests, weeds, extend their action on the microorganisms, so that both qualitative and quantitative changes occur in the population structure edaphic conditions and physiological activities [2,3]. Many pesticides are highly toxic and considered as a potential risk to both human health and environment [4]. The increasing public concern over the potential health hazard associated with exposure to pesticides has led to the strict regulation of maximum residue limits (MRLs) of pesticide residues in food commodities [5]. It is a fact that pesticide residues reach in food from plants.

Moreover the pesticides reach in plants from the soil. Therefore is very important to know what

happens in soil and which the best way to administrate the pesticides is. The goal of this research was to detect the pesticide residues (for Trifluralin, Metaclor and Prometrin) in soil and to estimate their remanence in soil after administration.

2. Materials and methods

Sample collection. A total of five hundred and seventy three samples were collected, of which 458 Timis and of 115 from Olt counties.

Gas chromatographic determination. The final residues were analyzed by gas chromatograph that allowed the detection of contaminants even at trace level concentrations (in the lower mg/g range) from the matrix to which other detectors do not respond.

The GC conditions used for the analysis were capillary column: 100-120 OV₁₁ on Chromosorb WHP. The injector and detector temperatures were set at 250°C. The column temperature was programmed at 200°C. Nitrogen was used as carrier

gas at a flow rate of 20 mL/ min. The injection volume of the GC was 2.0 µL [6,7].

3.Results and discussion

The obtained results for analysed samples are showed in table 1 and figures 1 and 2. These results are compared to legal requirements from OMS no. 6103/1995 which established limits for pesticides. The initial contents pesticides of samples were 2.0 ppm for Metachlor, 1.0 ppm for Trifluralin and 1.0 ppm for Prometrin.

From the experimental data resulted that the fastest deterioration was registered for Trifluralin.

The determinated amounts of this pesticide were 0.59 ppm at seven days and 0.21 ppm at fourteen days compared to 0.85 ppm value which was

registered initial. The calculated values for Prometrin were 0.74 ppm at seven days and 0.60 ppm at fourteen days. The recovered amounts of Metachlor in the soil (initial, at 7 days and at 14 days from the administration) were 1.90 ppm, 1.58 ppm and 1.12 ppm.

In Figure 2 are showed the degradation curves in soil for all three kinds of pesticides. According with these degradation curves it can said that the most rapid degradation was recorded for Trifluralin which was found, after 14 days from the administration, at a concentration of 21% relative to the administered amount. It followed Metaclor with 56% out of initial dose. The smallest degradation rate was noticed for Prometryn which was refound in proportion of 60% after 14 days.

Table 1. The estimated pesticides contents of analyzed soil samples

Specification	Metachlor				Trifluralin				Prometrin			
	Etalon	Initial	7 days	14 days	Etalon	Initial	7 days	14 days	Etalon	Initial	7 days	14 days
The retention time (min)	3,20	3,20	3.18	3.19	1,66	1,66	1,64	1,63	9,03	8,99	8.57	8.92
Concentration (ng/µl)	200	199	158	112	100	85.0	59.0	21	100	88	74	60
Concentration (ppm)	2	1,9	1,58	1,12	1	0,85	0,59	0,21	1	0,88	0,74	0,60

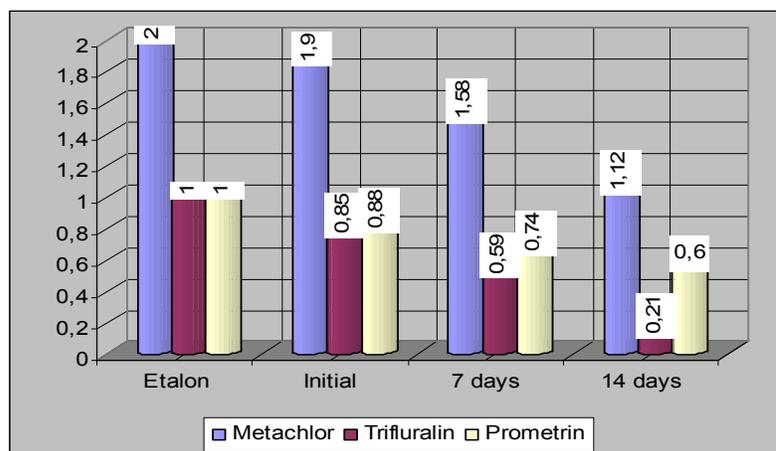


Figure 1. The amounts of pesticides from soil – initial, at 7 and 14 days

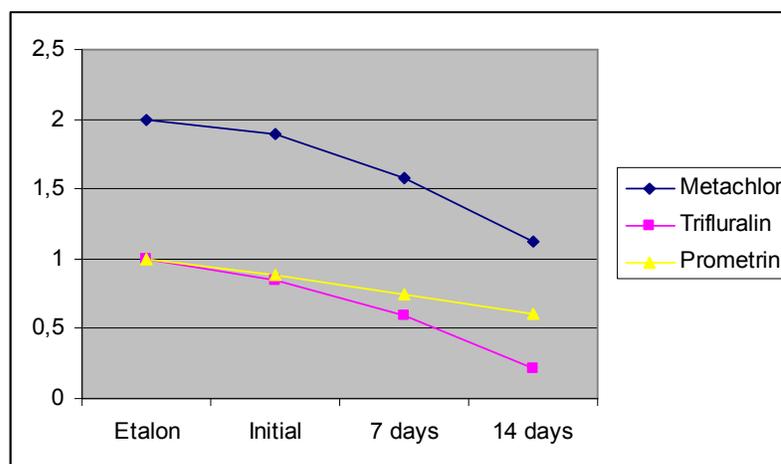


Figure 2. Metachlor, Trifluralin and Prometrin degradation curves in soil

Conclusions

The obtained results showed that the most rapid degradation was recorded for Trifluralin which was found, after 14 days from the administration, at a concentration of 21% relative to the administered amount. It followed Metaclor with 56% out of initial dose. The smallest degradation rate was noticed for Prometryn which was refound in proportion of 60% after 14 days.

To minimize losses due to the UV radiation action and volatilization of Trifluralin it is necessary that this pesticide to be incorporated into the soil.

Compliance with Ethics Requirements. Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human / or animal subjects (if exist) respect the specific regulation and standards.

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