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Interreg Sudoe
https://pollolegi.eu/

PESTICIDE RETENTION AND BIOLOGICAL AFFECTED PROPERTIES IN SOILS AMENDED WITH COMPOST AND BIOCHAR

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1. Introduction

Pesticide overuse is a common practice in intensive agricultural systems and leads to increasing levels of residues of such chemicals in soils and water, posing a high risk to public and ecological health. In soils, sorption and desorption processes are key factors that control the behavior of agrochemicals in the soil-water environment and are related with soil physical and chemical properties, organic amendments, and agricultural practices. Studying pesticide sorption can improve prediction of the mobility and availability of pesticides in soils and their effect on soil microbial communities.

The project **Poll-Ole-GI SUDOE** proposes the installation green infrastructures (GI) in agricultural fields with a double purpose: to improve habitat conditions for higher biodiversity, and to create natural barriers to avoid soil pollution by pesticides and excess nutrients.

2. Objectives

- To study the effect of soil type and organic amendments on the retention capacity of seven pesticides routinely used in cereal-sunflower rotations
- To analyze the effect of this mixture of pesticides on soil biological properties: soil respiration and microbial biomass

4. Soil and organic amendments (OA) properties

Soil No.	Soil Classification (FAO)	pH (1:5, H_2O)	EC (1:5, H_2O) (dS m^{-1})	Clay Fraction (<2µm) (%)	Organic Matter (%)
POG1	*Calcaric Cambisol*	8.2	0.311	10.7	5.1
POG3	*Calcaric Cambisol*	7.9	0.335	6.5	6.2
POG9	*Eutric Fluvisol*	6.0	0.262	2.9	1.6

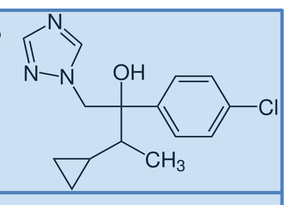
OA No.	Organic Amendment (OA)	pH (1:5, H_2O)	EC (1:5, H_2O) (dS m^{-1})	Total C (%)	Total N (%)
PB450	Pine pellet biochar 450 °C	7.9	0.193	66.7	<0.1
PB800	Pine pellet biochar 800 °C	9.4	0.469	80.1	0.4
VC	AgriFood Vermicompost	7.0	3.157	33.3	2.9

EC, electric conductivity; Clay Fraction (Ø<2µm) determined by Laser Diffractometry; Organic Matter determined by loss of ignition, 5 h at 550°C; Total C and N by combustion in LECO TruSpec

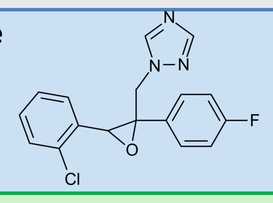
3. Pesticide Mixture

Internal Standards:
Triphenylphosphate (TPP) and
Deuterated Chlorpyrifos (D10)

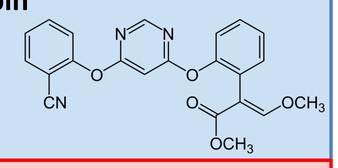
Cyproconazole
Fungicide
Cereal



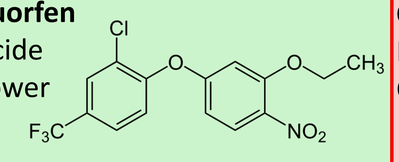
Epoxyconazole
Fungicide
Cereal



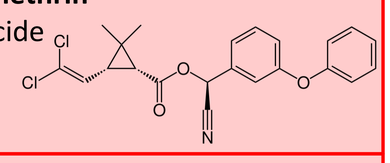
Azoxystrobin
Fungicide
Cereal



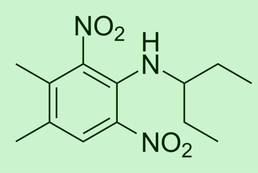
Oxyfluorfen
Herbicide
Sunflower



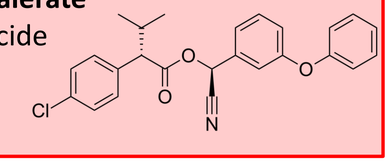
Cypermethrin
Insecticide
Cereal



Pendimethalin
Herbicide
Cereal



Esfenvalerate
Insecticide
Cereal



5. Pesticide retention capacity of Soils and OAs

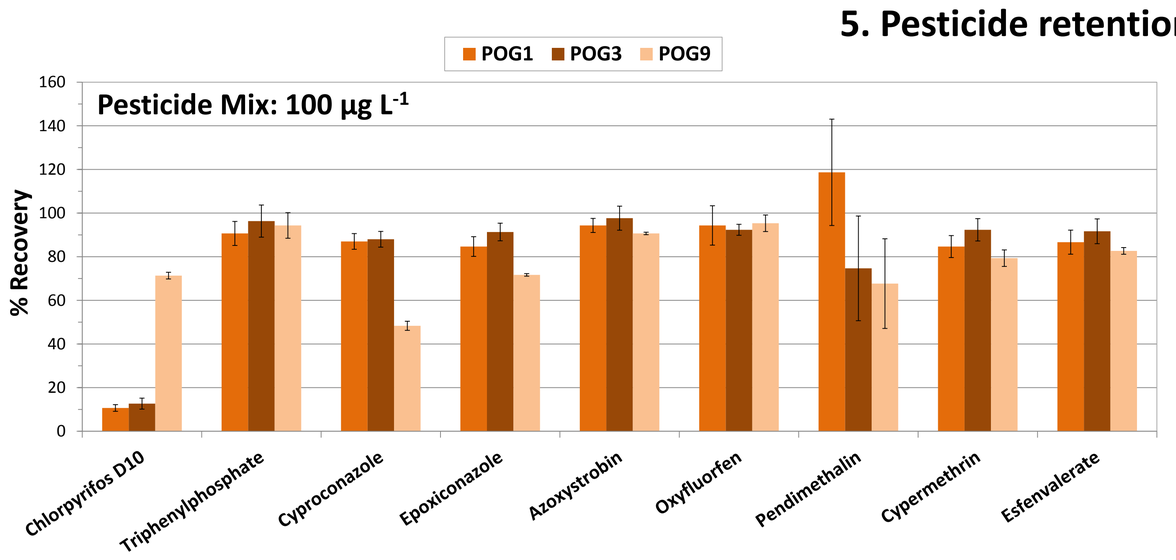


Fig.1 Pesticide recovery in soils after the addition of a mixture of 100 µg L^{-1} of each and 48 h in the dark

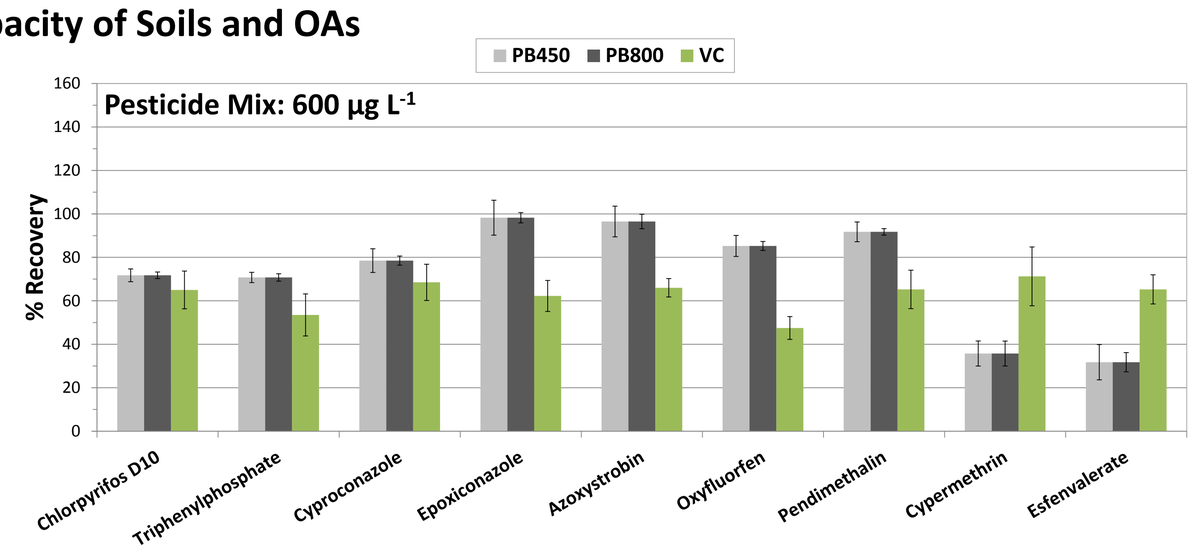


Fig.2 Pesticide recovery in OAs after the addition of a mixture of 600 µg L^{-1} of each and 48 h in the dark

6. Pesticide effects on soil biological properties

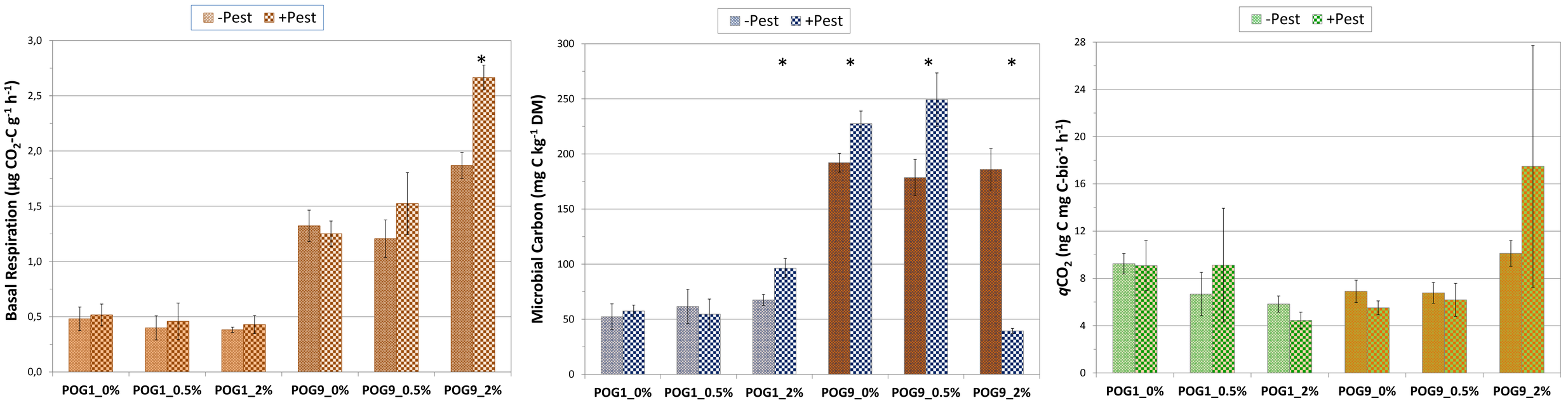


Fig.3 Effect of the addition of a Pesticide Mixture of 100 µg L^{-1} of each, on soil biological properties of mixtures of soils with VC: Basal Respiration, Microbial-C content and qCO_2. Asterisk's indicate significant differences between samples with or without pesticide addition

7. Conclusions

- The recovery of the Pesticide Mixture looks similar for most of the compounds, except for cyproconazole and epoxiconazole, which were less retanted in POG9, the sandy soil with low organic matter content and acidic pH values.
- Biochar pellets displayed higher recoveries than the compost for most of the compounds, except for the insecticides: cypermethrin and esfenvalerate.
- Pesticide addition increases the basal respiration and the microbial C content, mainly with the addition of compost. Non clear effect was observed for qCO_2 values.

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