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14th International HCH and Pesticides Forum

PRELIMINARY STUDY OF THE BIOREMEDIATION CAPACITY OF HORSE AMENDMENT IN SOILS CONTAMINATED WITH HCHS

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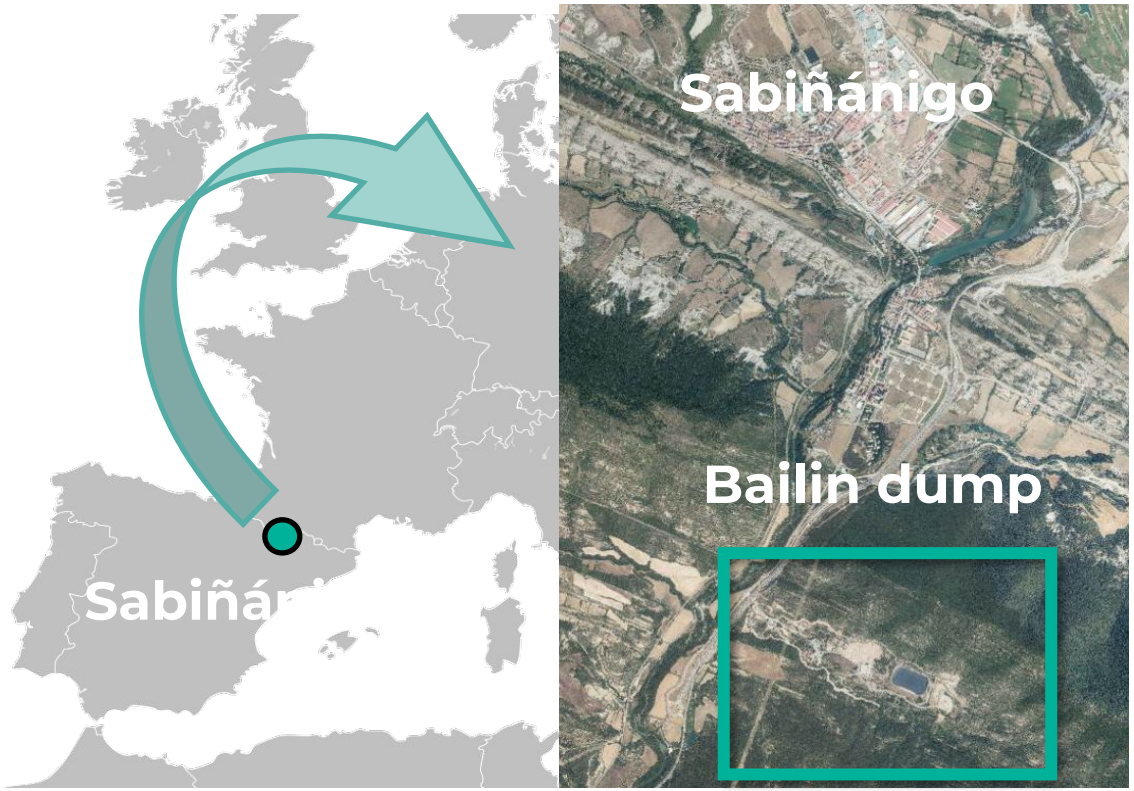
INTRODUCTION

- Use of **pesticides** led to an **increase** in **crop yields**
- **Technical Hexachlorocyclohexane (HCH)** and the **γ-HCH (lindane) isomer** after were between the most **widely used**
- In 2001 **α-HCH, β-HCH and γ-HCH** ->Persistent **Organic Pollutants (POPs)**
- **Effects** derived from the use of the **soil,** large amount of **waste** generated in the process and its **management**, sometimes **negligently**
- **Bioremediation** as an **effective** decontamination technique.
- Initial evaluation of the **bioremediation** capacity of **organic horse amendment** on soils with different **technical HCH** concentrations.

MATERIAL & METHODS

- Study area



- **Incorrect management** of HCH wastes
- Between 1975-1992 **115,000-160,000 tons** of **HCH wastes** were dumped
- Alternating layers of red shale and subvertical Tertiary sandstone, **hydrogeologically connected to the Gállego River**
- Predominant soils: cambisols, leptosols, calcisols and regosols

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MATERIAL & METHODS

Four treatments

Soil High Contamination (HC)

Soil Low Contamination (LC)

Soil High Contamination + Horse Amendment (5%) (HC-HA)

Soil Low Contamination + Horse Amendment (5%) (LC-HA)

Initial caracterization: pH, TOC, Pav and NH_4^+

Temporal evolution Days: 0-1-7-55

Soil biological activity

Carbon cycle:
β-glucosidase activity
Phenoloxidase activity

Nitrogen cycle:
Arylamidase activity
Urease activity

Phosphorus cycle:
Phosphatase activity

Living microorganisms
Dehydrogenase activity

+

HCH isomers

α-HCH
β-HCH
δ-HCH
ε-HCH
γ-HCH

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RESULTS & DISCUSSION

Soil parameters	HC	HC-HA	LC	LC-HA
pH	8.29	8.00	8.30	8.04
Total Organic Carbon (TOC) (%)	0.93	2.24	0.49	3.32
Available P (Pav) (mg/kg)	39.5	140	24.1	142
NH_4^+(mg/kg)	16.2	41.2	13.8	58.2

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RESULTS & DISCUSSION-Soil parameters

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- HA **decreased pH** 0.3
- HA **increased TOC** 2.4-6.8 times
- HA **increased Pav** 3.5-5.9 times
- HA **increased NH_4^+** 2.5-4.2 times

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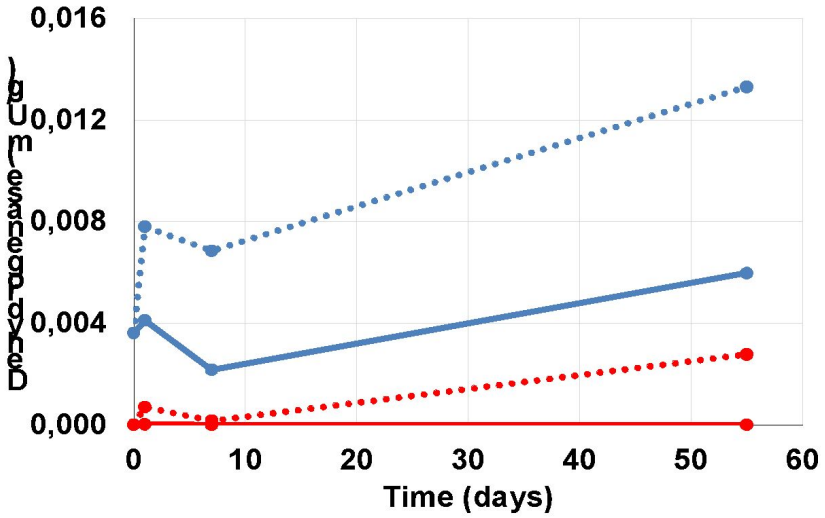
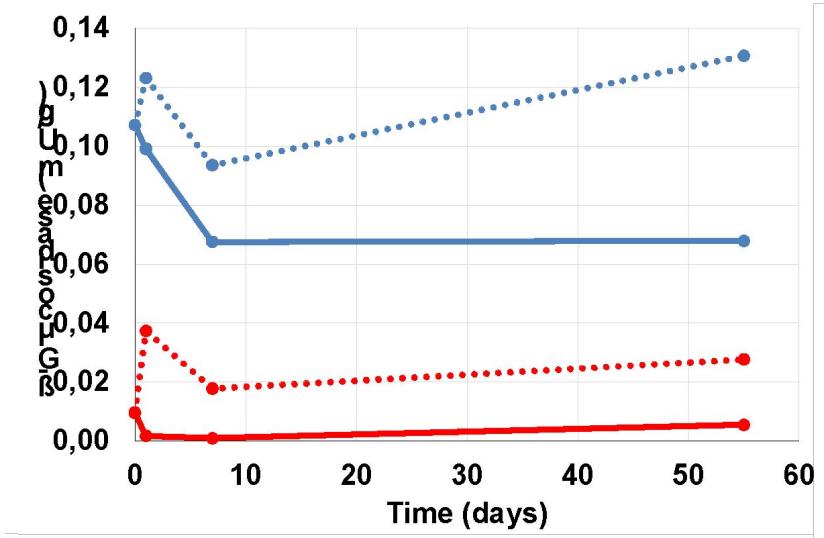
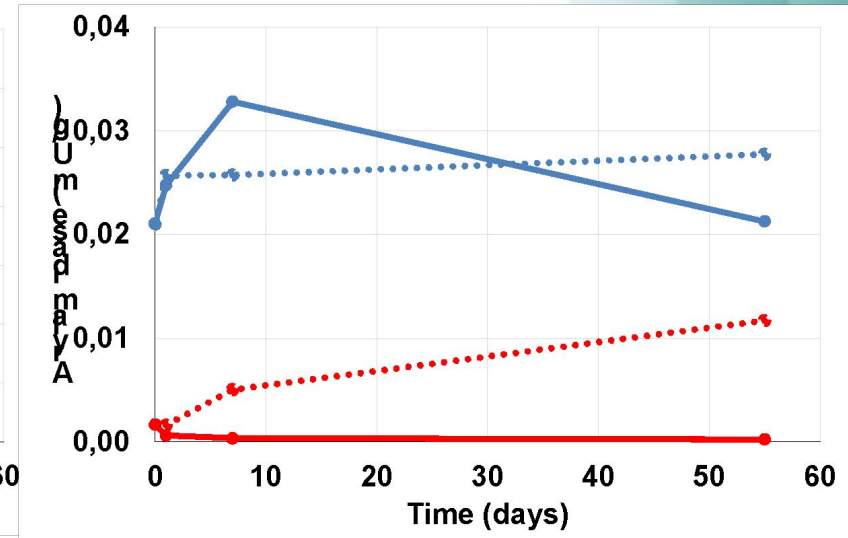
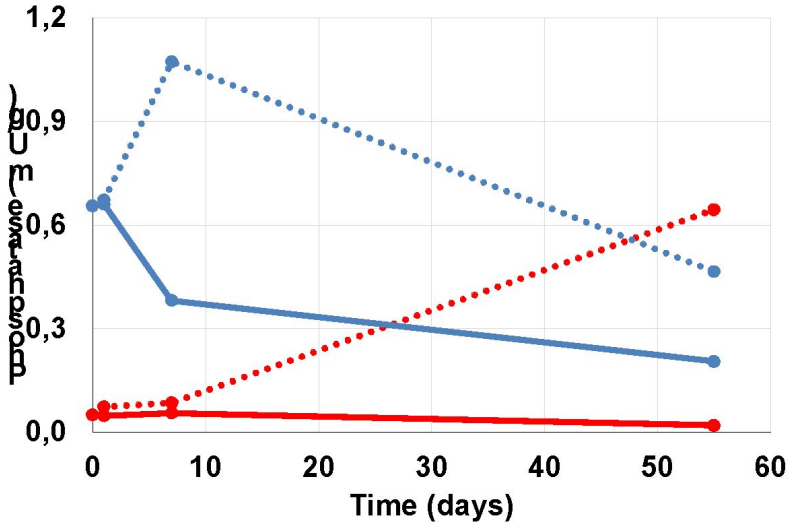
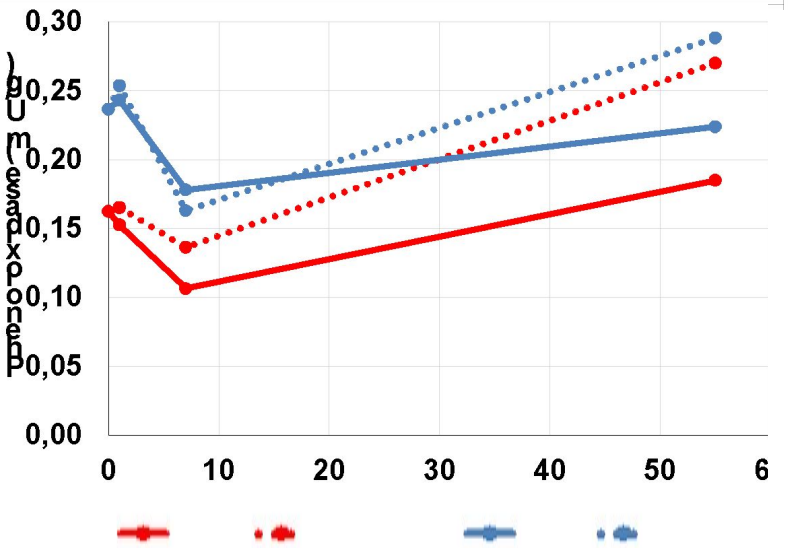
RESULTS & DISCUSSION-Biological activity

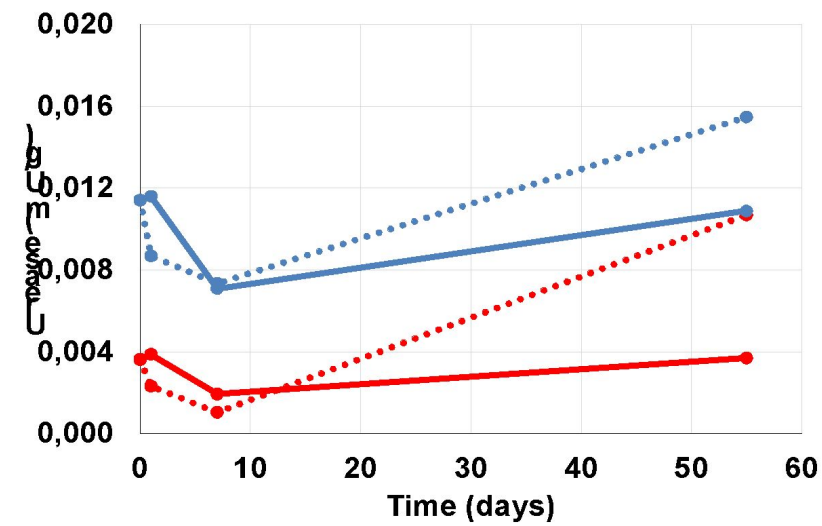




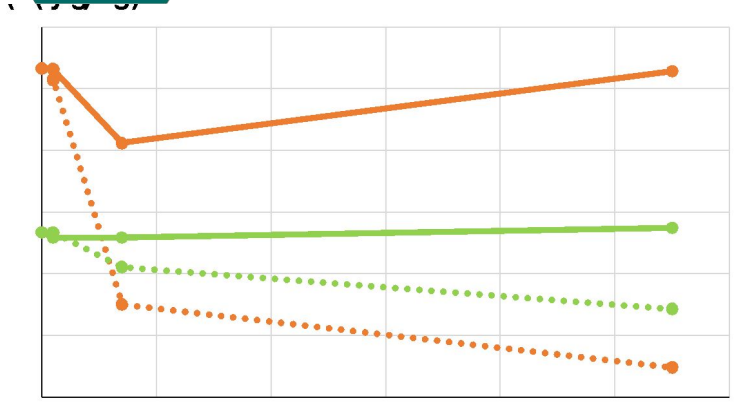


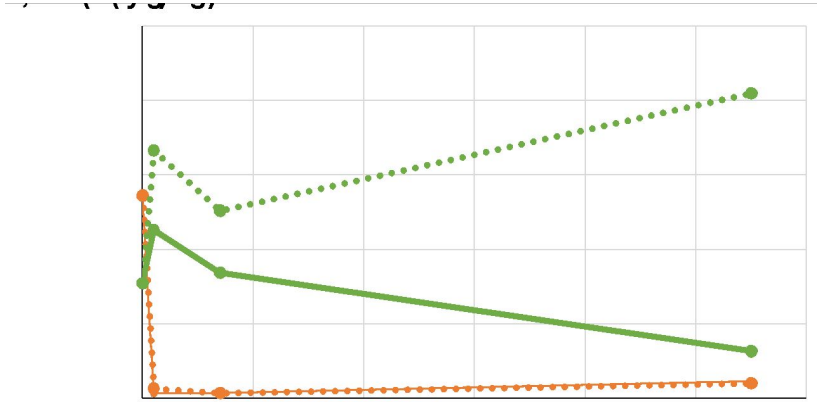


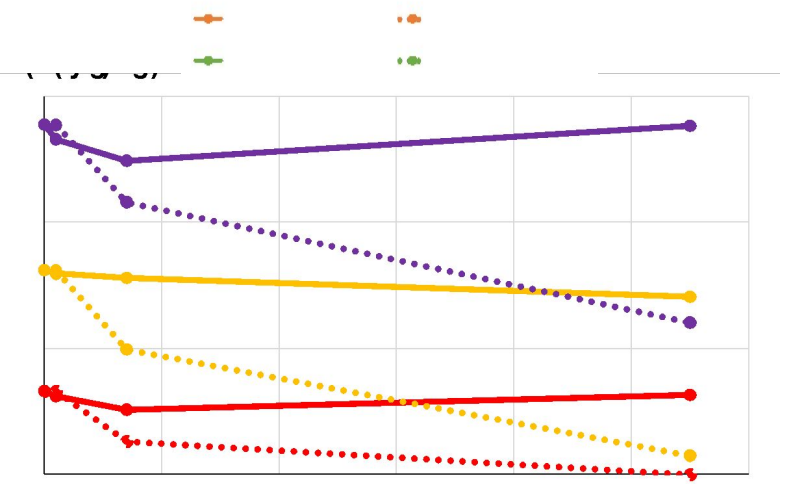


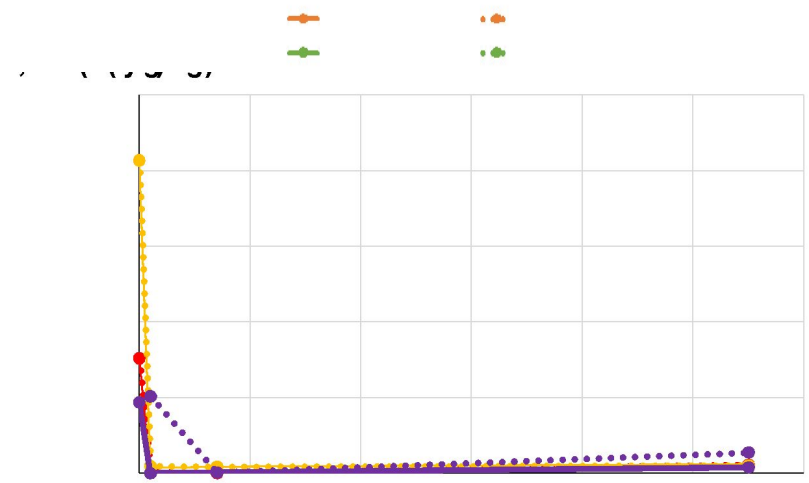


RESULTS & DISCUSSION-HCH isomers









High Contamination

- Horse amendment decreased concentration of HCH isomers
- β-HCH

Low Contamination

- Concentrations <0.5 ppm

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CONCLUSIONS

1) Organic horse amendment **increased nutrient availability** in soils

2) Organic horse amendment **stimulated soil enzyme activities**

3) Soils with organic horse amendment shown an **effective degradations** of **HCH isomers**

4) **Reduction** of HCH isomers **did not reach an asymptote** at the end of the experiment

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THANK YOU FOR YOUR ATTENTION

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