FIELD STUDY ON THE PERSISTENCE AND MOBILITY OF TRIASULFURON AND PROSULFOCARB AFTER REPEATED APPLICATION TO UNAMENDED AND GREEN COMPOST-AMENDED SOILS

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INTRODUCTION AND OBJECTIVE

The application of organic residues as amendments in agriculture increases the organic matter content of soils and contributes to avoid its degradation and to improve its quality and fertility. In addition, this practice may affect the physicochemical behavior of herbicides applied in these amended soils, which may vary their adsorption, mobility, degradation, persistence or bioavailability.

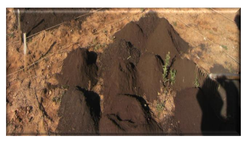
The objective of this work was to assess under field conditions the dissipation and mobility of two herbicides (prosulfocarb and triasulfuron) after their repeated application in unamended soil and soil amended with two green composts (GC-1 and GC-2) and under two irrigation regimes.

MATERIALS AND METHODS

➢ Soil:

	pH	OC (%)	DOC (%)	N (%)	C/N
Soil	7.35	1.30	0.006	0.12	10.8
Soil+GC-1	7.77	1.98	0.007	0.19	10.6
Soil+GC-2	7.30	4.66	0.027	0.42	11.0

➢ Organic Amendments:



	GC-1	GC-2
pH	7.33	7.58
CO (%)	9.80	24.1
N Total (%)	1.04	1.10
C/N	9.42	21.9

➢ Field experiment:

18 experimental plots (9 m^2):

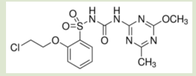
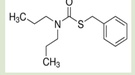
- **6 unamended soil**
- **6 amended with GC-1**
- **6 amended with GC-2**

For each treatment, 3 plots received additional irrigation of 2.5 mm/week.

➢ Herbicides:

- **Commercial formulation: Auros Plus (20% w/w Triasulfuron; 80% w/v Prosulfocarb)**

- **Doses: - Triasulfuron: 250 g a.i. ha^{-1}**
  - Prosulfocarb 11.25 kg a.i. ha^{-1}
  - Repetition of the application: when the herbicides DT_{50} was achieved in the most of plots (after 68 days)
- **Characteristics:**

	Triasulfuron	Prosulfocarb
Chemical Structure		
Water Solubility (mg L^{-1})	815 (20ºC)	13.2 (20ºC)
log K_{ow}	-0.59 (20º, pH 7)	4.48 (20ºC, pH 7)
DT_{50} field (days)	38.5	9.8
K_f	0.49	23.1

➢ Sampling:

- **Soil samples were collected at different times after both herbicides applications (0-215 days)**
- **From 0 to 10 cm: dissipation study**
- **From 0 to 50 cm: mobility study**

➢ Herbicides Extraction:

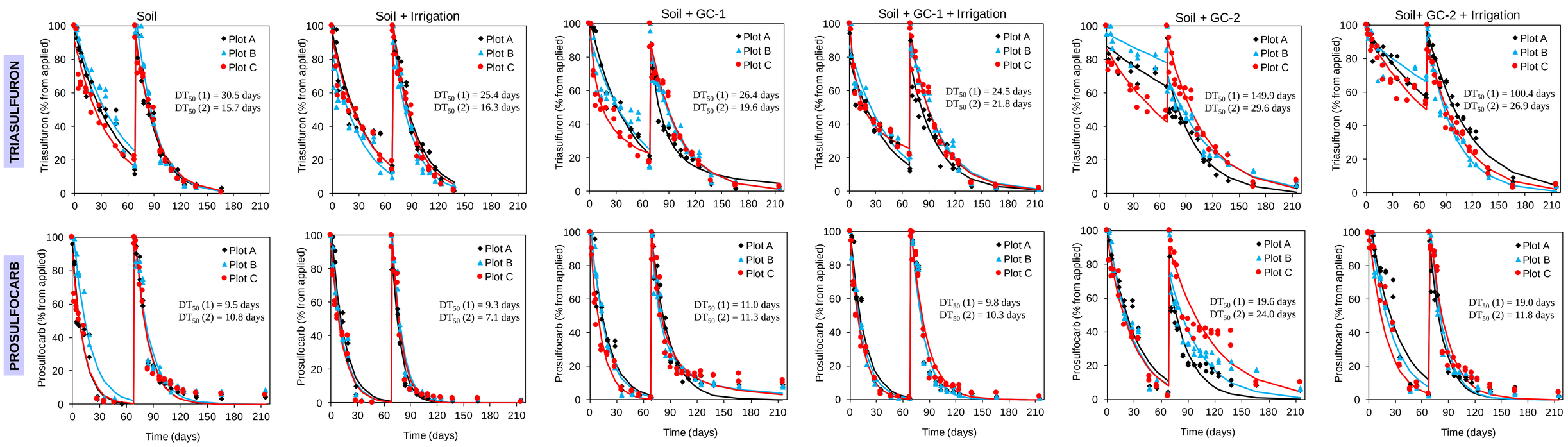
- **Homogenizing and sieving to 2 mm**
- **6g soil + 12 mL methanol; Ultrasonic bath (1h) / Rotatory shaker (24 h)**
- **Centrifugation / Evaporation of 8 mL under nitrogen stream / Re-dissolution on 0.75 mL of methanol + 1% of formic acid**

➢ Analytical Determination:

- **HPLC-MS:**
  - Mobile phase: acetonitrile:water +1% formic acid 70:30
  - Triasulfuron ion m/z = 402.8 (Retention time: 6.1 min)
  - Prosulfocarb ion m/z = 252.4 (Retention time: 14.1 min)

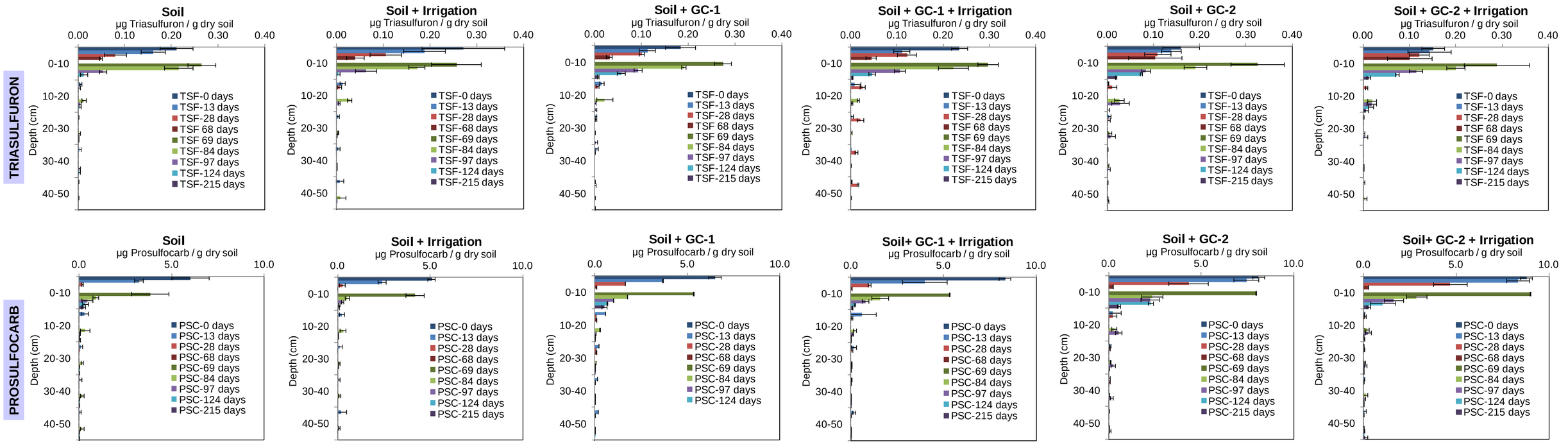
RESULTS AND DISCUSSION

DISSIPATION



- **The dissipation of prosulfocarb was faster than that of triasulfuron and the dissipation rate of both herbicides was faster in irrigated soils.**
- **The dissipation rate of both herbicides was lower in GC-2-amended soil. The higher OC content of GC-2 caused an increased in DT_{50} and this could contribute to an increase of herbicide adsorption and a decrease in its bioavailability and degradation.**
- **After the second application of triasulfuron to soil its dissipation rates increased while those of prosulfocarb were similar or increased slightly.**

MOBILITY



- **After 13 days, triasulfuron and prosulfocarb were mainly present on the surface (0-10 cm), decreasing their concentrations over time.**
- **Triasulfuron was determined through the soil profile after 13 days, specially in the 10-20 cm layer in S and S+GC-1. After 28 days, it was present in all layers, but significantly in S+GC-1 when additional irrigation was applied.**
- **The amount of prosulfocarb recovered in the surface decreased drastically after 28 days in S and S+GC-1. The presence of GC-2 increased the persistence of prosulfocarb due to its higher OC content, which could lead to a higher adsorption and lower mobility in soil.**
- **After the second application of the herbicides, the soil treatments did not have influence on the persistence of triasulfuron, while the mobility of prosulfocarb was again higher in S+GC-2, specially after 15 days. This could be related to a decrease of OC content over time on the soil surface.**

CONCLUSIONS

The dissipation and mobility of triasulfuron and prosulfocarb in an agricultural soil under field conditions was influenced by the type of GC applied to soil and by the irrigation regime. Both GCs increased up to twice the persistence of triasulfuron in the soil and this was also observed for prosulfocarb in S+GC-2. In addition, the application of GC-1 enhanced the amount of triasulfuron leached through the soil profile and also enhanced the amount of prosulfocarb mobilized to deeper layers. Finally, the second application of the herbicides had a similar effect than the first one for prosulfocarb, but it increased the persistence of triasulfuron in amended soils after 28 and 55 days of the second application of the herbicides.

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