Brief Research Report

ENVIRONMENTAL FATE OF TRIASULFURON IN SOILS AMENDED WITH MUNICIPAL WASTE COMPOST *

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Source-separated municipal waste compost (MWC) is often used in agriculture as an organic amendment in order to improve physical and chemical soil fertility. Recently, increased interest has been shown to the understanding of how the application of MWC may influence the behaviour of xenobiotics in the soil system. The amendment of soil with compost may significantly influence the mobility and persistence of pesticides and thus affect their environmental fate. Factors like adsorption, kinetics and rate of degradation of pesticides could be altered in amended soils.

The main objective of this study was to determine the effects of the addition of compost made from source-separated municipal waste and green waste, on the fate of triasulfuron, a sulfonylurea herbicide utilized in the post-emergence treatment of cereals. Two native soils with low organic matter content were used. A series of analyses was carried out to evaluate the adsorption and degradation of the herbicide in soil and in solution after the addition of compost and compost-extracted organic fractions namely humic acids (HA), fulvic acids (FA) and hydrophobic dissolved organic matter (HoDOM).

Results have shown that the adsorption of triasulfuron to soil increases in the presence of compost, and that the HA and HoDOM fractions are mainly responsible for this increase (Fig. 1). HoDOM applied to the soils underwent sorption reactions with the soils and in the sorbed state, served to increase the adsorption capacity of the soil for triasulfuron. The rate of hydrolysis of triasulfuron in solution was significantly higher at acidic pH and the presence of organic matter fractions extracted from compost also slightly increased the rate of hydrolysis. The rate of degradation in amended and non-amended soils is explained by a two-stage degradation kinetics. During the initial phase, although triasulfuron degradation was rapid with a half-life of ≈30d (Table 1), the presence of compost and HoDOM was found to slightly reduce the rate of degradation with respect to that in non-amended soil.

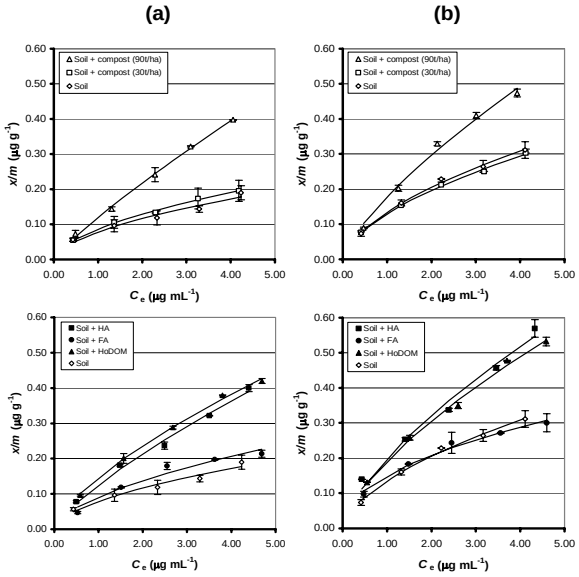

Figure 1: Adsorption isotherms of triasulfuron on (a) Filoncia and (b) Molinaccio soils in the presence and absence of compost, HA, FA and HoDOM. Error bars represent SE.

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Soil	$k \times 10^{-3}$†	$t_{½}$†	r^2
	day^{-1}	day	dimensionless
Filoncia	36 ± 2	19.3 ± 1.4	0.9860
+ compost	31 ± 1	22.5 ± 1.1	0.9936
+ HoDOM	28 ± 1	25.0 ± 1.2	0.9937
Molinaccio	35 ± 2	19.6 ± 1.4	0.9863
+ compost	30 ± 2	23.4 ± 2.0	0.9811
+ HoDOM	28 ± 1	25.2 ± 1.2	0.9940

† Value ± 95% Confidence interval.

Table 1: Degradation of triasulfuron in amended and non-amended soil during the first 25 days.