

Leaching of diuron through columns of undisturbed olive grove soil amended with two-phase olive mill waste

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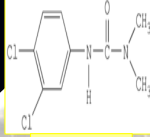
Introduction

The low organic matter content of most olive grove soils, together with their degradation problems, make it particularly interesting to enrich them, and improve their physical and chemical characteristics, with the addition of two-phase olive mill waste (TPOMW). Organic amendments can also play a significant role in the management of leaching losses of pesticides from soils. This study reports the effect of TPOMW amendment on the leaching of diuron using undisturbed soil columns.



Material and methods

Field experiments were conducted on an olive grove soil amended for seven years with TPOMW. Treatments included an unamended control, and 30 (TPOMW1) and 60 (TPOMW2) Mg ha⁻¹ DW equivalent. Three undisturbed soil columns [30 cm (l) × 20 cm (i.d.)] were extracted from each field plot. An application rate of 3 kg ha⁻¹ was applied to the top of the columns, and leachates were collected until no herbicide was detected. Leachates containing the herbicide were collected daily, filtered, and analyzed by HPLC. At the end of the leaching experiment, soil samples from the different depths of the soil column were extracted once with 30 mL of methanol by shaking mechanically at 20 ±2°C for 24 h. The suspensions were centrifuged, filtered, and analyzed by HPLC.

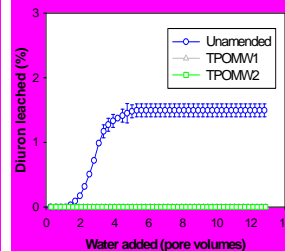
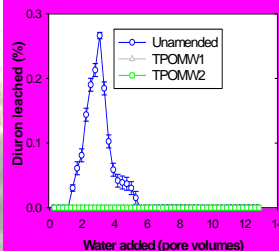
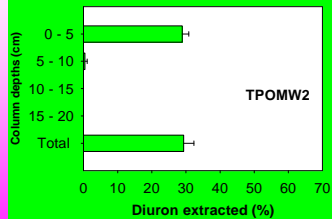
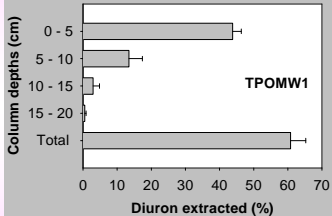
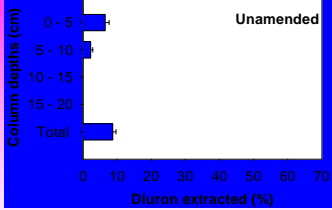


Results

The TPOMW soil application drastically reduced diuron's downward mobility in the columns. Thus, while 1.36% of the initially applied diuron was recovered in the leachate of unamended columns (Fig. 1), none was detected in that of amended columns, independently of the rate of TPOMW applied, reflecting the marked affinity of diuron for the organic amendment. These results are coherent with those reported by Albarrán et al. (2003), in which the addition of olive-mill waste to soils greatly retarded or even nullified the vertical movement of herbicides although in soil handpacked columns.

Table 1: Initial physicochemical characteristics of the soils and the organic amendment

Properties	Unamended	TPOMW1	TPOMW2	TPOMW
Organic carbon (g kg ⁻¹)	11.07	26.16	36.42	535
Soluble organic carbon (g kg ⁻¹)	0.142	0.224	0.489	36.5
pH (H ₂ O)	8.00	7.80	7.51	5.70
% Sand		60.61	-	-
% Silt		19.72	-	-
% Clay		19.67	-	-



The TPOMW soil application retained more diuron in the application zone. Only 6.5% of diuron retention was observed within the first 5 cm depth in the unamended soil column, whereas 39.3% and 30.2% of the applied herbicide was recovered for the TPOMW1 and TPOMW2 soil columns, respectively (Fig. 2).

Conclusions

The application of TPOMW as organic amendment, even at the lower rate, may be effective in reducing the leaching losses of diuron.

References

Albarrán A, Celis R, Hermosin MC, López-Piñeiro A, Ortega-Calvo JJ, Cornejo J (2003). Effects of solid olive-mill waste addition to soil on sorption, degradation and leaching of the herbicide simazine. *Soil Use and Manage.* 19:150-156.

Acknowledgments

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