



Facilitated transport of diuron and glyphosate in high copper vineyard soils

S. Dousset (1) JB. Dessogne (2) AR. Jacobson (3) N. Guichard (4) P. Baveye (3) F. Andreux (1)

(1) UMR INRA 1229 Microbiologie-Géochimie des Sols, Centre des Sciences de la Terre, Université de Bourgogne, 6 Bd Gabriel, 21000 Dijon, France

(2) Now at Groupe d'Etude sur les Geomatériaux Naturels et Anthropiques (GEGENA), Université de Reims, 9 Bd de la Paix, 51100 Reims, France

(3) Department of Crop and soil Sciences, Cornell University, 1002 Brdfield Hall, Ithaca, NY 14853, USA

(4) UMR CNRS Biogéosciences, Centre des Sciences de la Terre, Université de Bourgogne, 6 Bd Gabriel, 21000 Dijon, France

(Sylvie.dousset@u-bourgogne.fr / Fax: 33 (0)3 80 39 63 87 / Phone: 33 (0)3 80 39 68 88)

Pesticide leaching through soils may occur in a 'free' form, or in a 'bound' form. Bound pesticides may result from interactions with endogenic soil components such as organic matter, or exogenic components such as copper from 'Bordeaux' mixture. Few studies deal with the facilitated transport of 'bound' pesticides, in particular, pesticides complexed with copper.

The objective of this work was to study the influence of soil copper levels on the leaching of diuron and glyphosate through vineyard soils. A calcareous soil from Vosne-Romanée (Bourgogne, France, 21) and an acidic soil from Odenas (Beaujolais, 69) were sampled from 0-10 cm, dried and sieved to 2 mm. The background copper concentrations were 17 mg.kg^{-1} and 34 mg.kg^{-1} in the calcareous soil and the acidic soil, respectively. Each soil was enriched with copper sulfate to obtain the following total soil copper concentrations: 125, 250, 500 and 1000 mg.kg^{-1} . For each treatment, the leaching of diuron and glyphosate was studied in sieved soil columns (6 x 6.8 cm) under laboratory conditions.

For both soils, glyphosate leaching was influenced by the soil copper level, whereas diuron leaching was not.

In the calcareous soil, glyphosate leaching decreased as the copper level increased from 17 mg.kg⁻¹ to 500 mg.kg⁻¹. This result may be explained by a formation of soil-copper-glyphosate ternary complexes. On the other hand, in the acidic soil, glyphosate leaching increased as the copper level increased from 34 mg.kg⁻¹ to 500 mg.kg⁻¹.

In both soils, the shapes of the copper elution curves in presence of glyphosate were similar to those of glyphosate (except for the acidic soil with the copper level of 500 mg.kg⁻¹). This suggests the formation of Cu-glyphosate complexes leaching through the calcareous and acidic soils.

In conclusion, the application of 'Bordeaux' mixture does not influence diuron leaching in calcareous or acidic soils. However, increasing copper concentrations in soils reduces glyphosate leaching through calcareous soils, and adversely, increases glyphosate leaching through acidic soils. Therefore, in acidic soils with high copper contents, glyphosate should be applied lightly and judiciously.