



Distribution and fate of pesticides and trace metals in a small stream draining an agricultural watershed – Assessing the effect of hydrological conditions on the transport of contaminants.

M. Rabiet, M. Coquery, C. Margoum, C. Guillemain, V. Gouy, N. Carluer

Agricultural and Environmental Engineering Research Institute (CEMAGREF), Water Quality and Pollution Protection Unit, Lyon, France (rabiet@lyon.cemagref.fr / Fax: +33 478 47 78 75 / Phone: +33 472 20 89 16)

The intensive use of pesticides to protect culture against diseases leads to the occurrence of these compounds in aquatic ecosystems. The aim of the present study is to better understand the behaviour of these agricultural contaminants in surface waters and in particular, their temporal and spatial dynamic. A simultaneous monitoring of selected pesticides and trace metals was achieved in a small agricultural watershed, the Morcille. The Morcille is a small stream (8 km long) located in the Beaujolais area (France) and subjected to a strong agricultural pressure due to vineyards.

Water samples were collected during the spreading period (from March to September 2006) in different hydrological conditions (baseflow and stormflow). Three summer storm events were studied using automatic sampler. Spatial monitoring along the river was also achieved in order to assess the upstream-downstream variability. Eight pesticides (1 herbicide and its main metabolites and 5 fungicides) as well as trace metals (As, Cu) were analysed in dissolved phase (D) and suspended particles (SP).

All the 8 pesticides were detected in the river. Total pesticide concentrations downstream ranged between 0.2 and 5.4 $\mu\text{g/L}$ in baseflow. A large gradient of trace metal and pesticide concentrations was observed along the river. For instance, total Cu and As concentrations rose by a factor up to 17 and 4 respectively, from upstream to downstream. These observations can be attributed to the increasing proportion of vineyard surface in the Morcille watershed going downstream. Pesticides concentrations follow

a seasonal variation, related to their spreading period. Moreover, during storm events, total dissolved concentration of pesticides in surface waters can be multiplied by a factor up to 40 due to the runoff on agricultural surface. This highlights the strong contribution of floods to the overall transport of contaminants in this small river. The distribution of trace metals between D and SP indicates that the particulate phase can account up to 40% of total Cu transported in the river in baseflow. It is not the case for As, which is mainly transported in the dissolved phase.

This preliminary study shows the importance of floods in the transfer of pollutants. Future sampling campaigns will focus particularly on flood events in order to better characterise the river response to storms in terms of transport of contaminants. The results should allow to better estimate contaminants load and the exposure of the aquatic compartment to agricultural contaminants.