Geophysical Research Abstracts
Vol. 19, EGU2017-13880, 2017
EGU General Assembly 2017

Impact of the rainfall pattern on synthetic pesticides and copper runoff from a vineyard catchment

Sylvain Payraudeau, Fatima Meite, Charline Wiegert, and Gwenaël Imfeld
LHyGeS (UMR 7517, University of Strasbourg/ENGEES, CNRS), Strasbourg, France (sylvain.payraudeau@engees.unistra.fr)

Runoff is a major process of pesticide transport from agricultural land to downstream aquatic ecosystems. The impact of rainfall characteristics on the transport of runoff-related pesticide is rarely evaluated at the catchment scale. Here, we evaluate the influence of rainfall pattern on the mobilization of synthetic pesticides and copper fungicides in runoff from a small vineyard catchment, both at the plot and catchment scales. During two vineyard growing seasons in 2015 and 2016 (from March to October), we monitored rainfall, runoff, and concentrations of copper and 20 fungicides and herbicides applied by winegrowers at the Rouffach vineyard catchment (France, Alsace; 42.5 ha). Rainfall data were recorded within the catchment while runoff measurement and flow-proportional water sampling were carried out at the outlet of the plot (1486 m2; 87.5 $\times$ 17 m) and the catchment. In total, discharges of the 14 runoff events were continuously monitored between March and October 2015 using bubbler flow modules combined with Venturi channels. Detailed and distributed dataset on pesticide applications were extracted from survey (copper formulations and type of pesticides, amount and application dates). Pools of copper and synthetic pesticides were quantified weekly in the topsoil (0-3 cm) by systematic sampling across the catchment. The concentrations of copper (10 mg.kg-1 dried soil) and synthetic pesticides (close to the quantification limit, i.e. 0.05 μg.L-1) available in the top soil for off-site transport largely differed over time. Between March and October, an accumulation of copper of 10% was observed in the top-soil while pesticide concentration decreased below the quantification limits after a few days or weeks following application, depending of the compounds. The average runoff generated at the plot scale was very low (0.13% $\pm$ 0.30). The maximum runoff reached 1.37% during the storm of July 22, 2015. Synthetic pesticides exported by runoff was less than 1‰ of the applications. The copper mass exported represented about 1% (i.e. 2,085 g at the plot's scale) of the seasonal input, and mainly occurred during the major storm event. Copper were mainly exported in association with suspended particulate matter (SPM) (>80% of the total load). The partitioning between dissolved and SPM phases differs for the synthetic pesticides as expected by their properties. The rainfall pattern influences concentrations and loads of copper and the pesticides. Dissolved pesticide loads normalized by the pesticide mass in soil varied with larger rainfall intensities, runoff discharges and volumes. Contrasted relationships between rainfall characteristics (i.e. intensity, duration and total amount) and the load exported suggest that mechanisms of contaminant delivery from the vineyard soil differs among the pesticides and for copper. The results support the idea that, even in small catchment areas, the rainfall pattern (i.e. rainfall intensity and duration) partly controls the transport of pesticide and copper loads in runoff. Though other factors, such as the chemical characteristics and the amount and timing of applications, are important drivers for pesticide runoff, the rainfall patterns also determine the transport of pesticides from catchment to downstream aquatic ecosystems, and thus the ecotoxicological risk.