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Transfer of pesticides in vineyard: the variable contribution of runoff and erosion

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The Layon River, a tributary of the Loire River, does frequently not comply with water quality standards because of pesticides. Vineyard is generally denounced.

The aim of this project is to explain the transfer of pesticides during runoff events and its interaction with erosion. Pesticides and suspended particulate matter (SPM) concentrations are monitored each 2 minutes during floods to follow peaks. The results of two different hydrological years: 2009, a mean wet year and 2011, a dry year.

The 2.2ha catchment is composed of two main vineyards plots managed by two independent farmers. Mean slopes are of 8% and can reach 40% in terraces.
A gauging station has been installed at the end of the slope with a calibrated Venturi channel. The measurement station is composed of (a) an approach channel of 10 meters long for the establishment of a stable water surface, (b) a trapezoidal long-throated flume to assess the flow rate with the water level measured with (c) a bubbler sensor, (d) an automatic rain gauge, (e) an automatic sampler, (f) a modem and (g) a logosens OTT® data logger.

Peaks of SPM are correlated with peaks of discharges. In 2011, on 22 molecules used by farmers, 11 have been detected in collected samples. Peaks of pesticides concentrations were particularly high in 2009, frequently reaching 50 or 70 μg/L and even 449μg/L for glyphosate for a runoff event which happened just after the treatment. Results demonstrate first a peak intensity of pesticides in runoff waters in relation with the date of application with a decrease of concentrations during time after the treatment and second a relation between peaks of SPM and pesticides. Moreover, during the most important flooding events with a high erosion capacity in 2011, pyraclostrobine and indoxacarbe coming from treatments which occurred respectively one and two years before have been analysed. However, runoff events in 2011 were half than 2009 as it was a particularly dry year while erosion was more important. Thus, if results demonstrate the relation between erosion and pesticides transfer, this cannot systematically explain the peaks. In fact, analysis on filtered and non-filtered (0.45μm) samples did not confirm results as differences between values were only in the range of variability of pesticides analysis.

To conclude, transfer of pesticides in this catchment is strongly linked to runoff more than erosion. This probably explains why the percentage of surface remained un-weeded in 2009 was not sufficient to stop the transfer. The project is now focusing on the adsorption capacity of SPM in order to propose possible adaptation practices in the fields to decrease the transfer of pesticides during runoff.

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