Geophysical Research Abstracts,
Vol. 10, EGU2008-A-02221, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-02221
EGU General Assembly 2008

The Base Flow Index and the volume of fast flow as proxies for the susceptibility of catchments to diffuse herbicide losses to surface waters

C. Leu (1), M.K. Schneider (2,3) and C. Stamm (2)

(1) Syngenta Crop Protection, Basel, Switzerland, (2) Swiss Federal Institut of Aquatic Science and Technology (Eawag), Dübendorf, Switzerland (christian.stamm@eawag.ch) , (3) Agroscope Reckenholz-Tänikon Research Station, Zürich-Rechenholz, Switzerland

Diffuse herbicide losses to surface waters are mainly due to fast transport processes carrying the compounds from the fields to streams. The prediction of fast flow occurrence based on process-based models is data and time-demanding and laced with uncertainties. We suggest the Baseflow-Index (BFI) as a proxy for the susceptibility of catchments for diffuse herbicide losses. To test the usefulness of the BFI for that purpose, we analyzed time-series of diffuse losses of an important corn herbicide (atrazine) in 6 watersheds in North America and Europe. In all catchments, the percentage of the applied amounts lost to the streams was positively correlated to the volume of fast flow during the spring flush period (May - July). The slope of the correlation, however, differed strongly between the catchments. The lower the BFI, i.e. the lower the contribution of the baseflow component, the stronger the loss increase with the volume of fast flow. Accordingly, the catchments differed little during dry years, with the relative atrazine losses being less than 1.0% of the applied mass if fast flow did not exceed 25 mm during the spring flush. During wet years however, catchments with a low BFI lost significantly more atrazine than those with a high BFI. For 100mm of fast flow for example, there was a four-fold difference (1% to 4% losses) between the catchments with low and high BFI. Overall, the susceptibility of a catchment to diffuse herbicide losses can be estimated by the two proxies BFI and volume of fast flow during the spring flush period. While the BFI captures the main effects of the soil hydraulic properties affecting the herbicide losses, the fast flow volume describes the

influence of weather conditions..

We propose two hypotheses for the BFI effect on herbicide losses. First, it may be assumed that the more fast flow occurs, the higher the percentage of event-water during stormflow conditions that contribute to transport of herbicides. Measurements of electrical conductivity in several small agricultural catchments in Switzerland from spring to autumn 2007 will serve as a test for this hypothesis. A preliminary analysis indicates that a low BFI implies a larger contribution of event water (30 - 40% for a BFI of about 0.5) during stormflow periods in contrast to only 5 to 20% for catchments with a high BFI (BFI in the order of 0.7). The second hypotheses, which may act simultaneously, assumes that the more rain is needed to trigger fast flow with increasing BFI, the more herbicides will have leached out of the topsoil into deeper layers before they get mobilized into fast flow.