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Influence of vegetative filter strips on heavy metal retention in runoff waters: a laboratory evaluation

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Point-polluted industrial sites can be exposed to water erosion, leading to a dispersion of, e.g., heavy metal contaminated soil particles. Sowing vegetative buffer strips could limit this problem. We therefore investigated the influence of different vegetative filter strips on heavy metal retention, for runoff water loaded with two different polluted sediments.

An experimental flume was built in order to simulate sediment retention by short vegetative buffer strips for different runoff discharges, slopes and sediment concentrations. At the lower bound of the flume, a 0.58 m wide x 1 m long x 0.1 m deep cage filled with soil could be inserted. Three treatments were considered: bare soil and soil sown with either *Trifolium repens* or *Lolium perenne.* The plants were allowed to grow for 2 months after germination. The setup allowed characterizing the water and sediment discharge at the outlet of the vegetative strips by means of a tipping bucket with splitter device.

Heavy metal-polluted soils were collected at two industrial sites highly polluted with 1) arsenic and lead (Ath), and 2) cadmium and zinc (Prayon). We investigated the effects of the three different covers for these two sediment types (4 replications by treatment), with a slope of 8%, a discharge of 1.7 m^3/h and a sediment concentration of 10g/l. Besides sediment mass, we determined heavy metal concentrations and particle size of the sediments collected both at the outlet of the flume and in the sediment deposits upstream of the strips. Following these experiments, size separation of the initial soils was performed, to analyze heavy metal concentrations of each size class. Finally, selective extractions (water, $CaCl_2$ and EDTA) were performed, allowing estimation of heavy metal soluble fractions not retained by vegetative filter strips.

	Ath		Prayon	
	As [%]	Pb [%]	Cd [%]	Zn [%]
Lolium perenne	24.1	21.5	23.7	21.2
Trifolium repens	47.8	40.5	55	52.4
Bare soil	20.5	10.9	26.5	22.1
Concentrations [mg/kg]	800	40000	42	2400

Heavy metal retention by vegetative filter strips and mean concentrations [mg/kg] of soils.

Heavy metal concentrations increased at the outlet of the flume because of selective sedimentation. Vegetative filter strips with *Trifolium repens* were the most effective to trap sediments and heavy metals. These strips slowed significantly the flow, leading to important sediment deposits upstream. *Lolium perenne* were not more efficient than bare soil, because of its erected posture and its low number of tillers after 2 months.