TEMPORAL EFFECTS RAINFALL ON P-TRANSPORT OF AN HEAVILY ERODED HUNGARIAN SOIL

A field rainfall simulation study

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INTRODUCTION: Combating non point pollution sources requires a clear understanding of the P leaching mechanisms and transfer pathways from the field to the water also in relation to temporal changes during the year. The main goal of this experiment was to get information about these temporal effects by applying simulated rainfalls repeatedly on the same plots and studying P release in sediment and surface runoff on a heavily eroded soil in Western Hungary.

MATERIAL & METHODS: Rain events were simulated (three events simulation/plot; slope: 13%; intensity: 1 mm min^{-1}) on 10 m^2 plots of a bare field at Somogybabod (soil: cambisol, heavily eroded site), near Lake Balaton, Western Hungary. We measured soil loss, runoff, total P of suspended sediment (TP) and reactive P in the filtrate (RP). Results presented are mean values of four replicates for each repeated rain application.

RESULTS: The significant effect of the successive rainfall application on soil loss was apparent (Fig. 1). As a result of the soil surface condition, the time to reach steady runoff conditions was reduced (Fig. 2).

Figure 1: Soil loss during successive rainfall (g min^{-1} m^{-2}) vs. time (min)

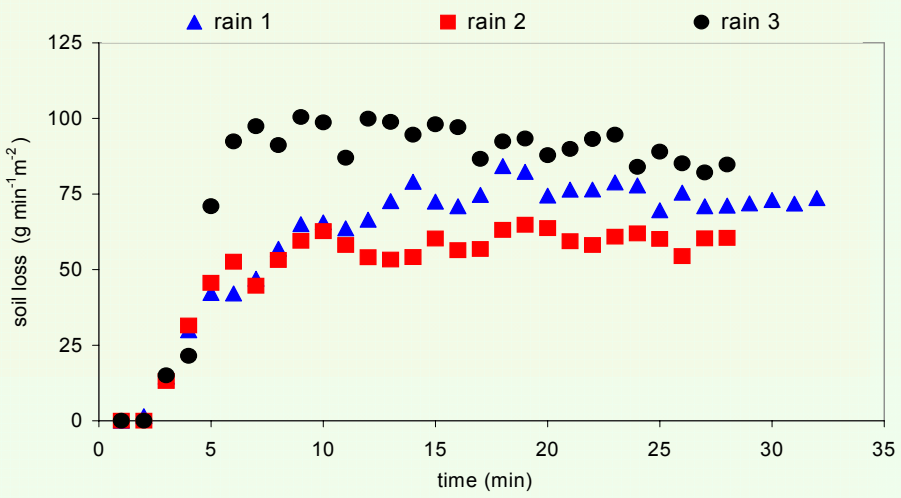

Figure 2: Surface runoff during successive rainfall (l min^{-1} m^{-2}) vs. time (min)

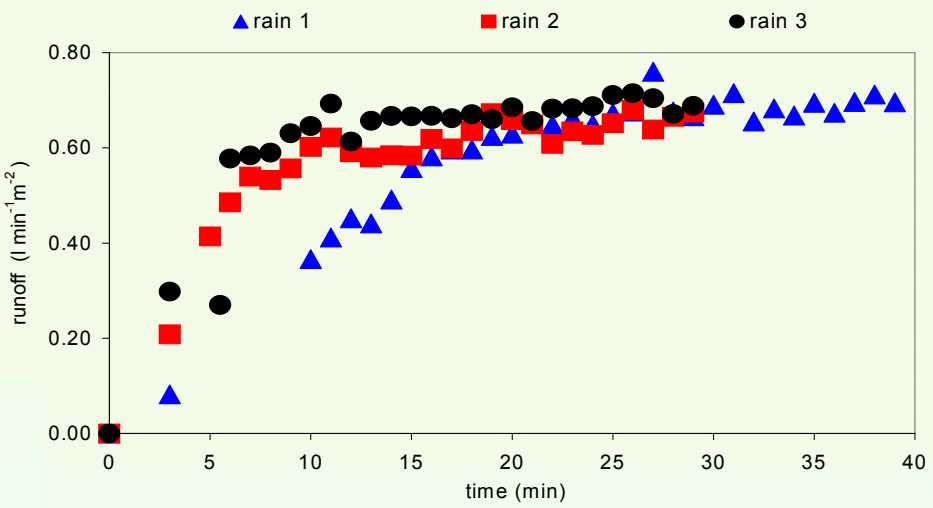

Figure 3: TP (mg kg^{-1}) vs. Sediment concentration (g $l^{-1}min^{-1}m^{-2}$)

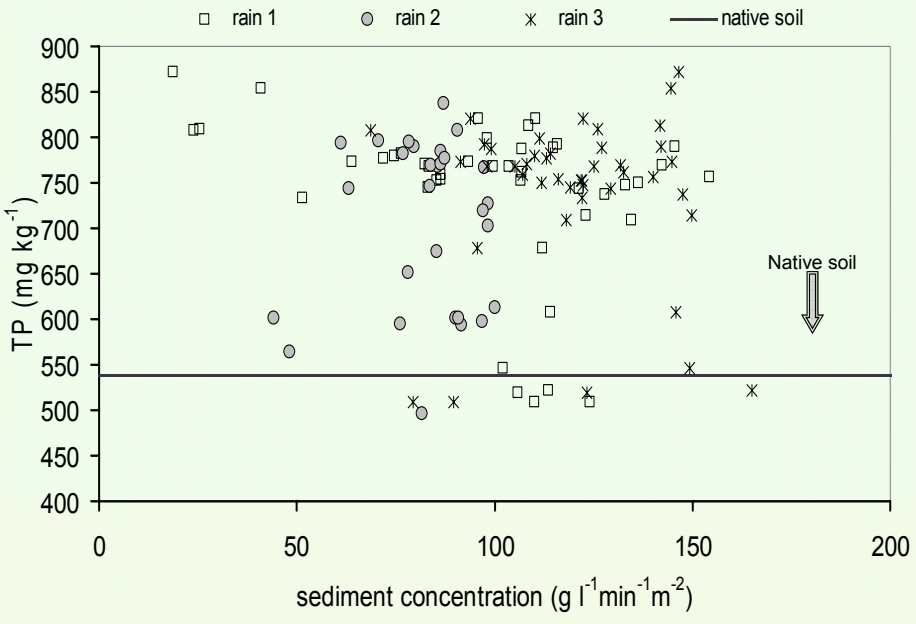

Table 1: Mean RP concentration (RP-mean), maximum RP concentration (RP-max), RP concentrations at steady state runoff condition (RP-steady state) and standard deviation for RP concentrations at steady state runoff (RP-sx) (all in mg l^{-1})

	RP-max	RP-mean	RP-steady state
rain 1	n.a.*	0.01	0.01
rain 2	n.a.	n.a.	n.a.
rain 3	0.04	0.01	0.01

*n.a: not available

SUMMARY and DISCUSSION: Reactive P (RP) concentration was relatively constant with each successive rainfall, varying between 0 and 0.04 mg l^{-1} (Table 1). From Fig. 3 a gradual P enrichment of eroded sediment compared to native soil becomes apparent. There was no significant effect of successive rainfall on TP and RP.
Pote et al. 1996 reports a decline of RP concentrations with increasing runoff volumes and attributes this effect to dilution of RP concentrations. No effect of runoff volume on the RP concentration during the different rains could be detected in our work. This might be attributed to the very low level of RP concentrations in general compared to the results of Pote et al. (1996).

REFERENCES: Pote D.H., Daniel T.C., Sharply A.N., Moore Jr. P.A., Edwards D.R. and Nichols D.J. 1996. Relating extractable soil phosphorus losses in runoff. Soil Sci. Soc. Am. J. 60:855-859.