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Effect of soil surface conditions on runoff velocity and sediment mean aggregate diameter

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Soil cover and soil management are the factors that most influence soil erosion by water, because they directly affect soil surface roughness and surface cover. The main effect of soil cover by crop residues consists in dissipation of kinetic energy of raindrops and also partly kinetic energy of runoff, so that the soil disaggregation is considerably reduced but, in addition, soil cover captures detached soil particles, retains water on its surface and decreases runoff volume and velocity. In turn, soil surface roughness, influences soil surface water storage and infiltration and also runoff volume and velocity, sediment retention and subsequently water and sediment losses. Based on the above rationale, we performed a field experiment to assess the influence of soil cover and soil surface roughness on decay of runoff velocity as well as on mean diameter of transported sediments (D_{50} index). The following treatments were evaluated: SRR) residues of Italian ryegrass (*Lolium multiflorum*) on a smooth soil surfcace, SRV) residues of common vetch (*Vicia sativa*) on a smooth soil surface, SSR) scarification after cultivation of Italian ryegrass resulting in a rough surface, SSV) scarification after cultivation of common vetch resulting in a rough surface, and SBS) scarified bare soil with high roughness as a control. The field experiments was performed on an Inceptisol in South Brazil under simulated rainfall conditions during 2012. Experimental plots were 11 m long and 3.5 m wide with an area of 38.5 m^2. Six successive simulated rainfall tests were applied using a rotating-boom rain simulator. During each test, rain intensity was 60 $mmhr^{-1}$, whereas rain duration was 90 minutes. Runoff velocity showed no significant differences between cultivated treatments. However, when compared to bare soil treatment, SBS (0.178 m s^{-1}) and irrespective of the presence of surface crop residues or scarification operations, cultivated soil treatments significantly reduced runoff velocity (0.057 ms^{-1}). Moreover, treatments with crop residues showed a higher persistence in the reduction of the runoff velocity with increasing cumulative rainfall than scarified treatments. Index D_{50} was higher for SBS treatment (1.522 mm) than for cultivated soil treatments (0.386 mm) and there were no significant differences between treatments with surface crop residues and scarified treatments. Irrespective of soil management, treatments with Italian ryegrass were more efficient in reducing D_{50} than common vetch treatments.