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Assessment of the effectiveness of Palm and simulated geotextiles in reducing runoff and interrill erosion on medium and steep slopes

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Palm-leaf geotextiles could be an effective and cheap soil conservation method, with enormous global potential. However, there are very few data on the effectiveness of (palm) geotextiles in reducing soil erosion by water. This study investigates the effectiveness of two types of palm geotextiles and the effect of geotextile mesh size on infiltration, runoff and interrill erosion rate and soil surface roughness on a medium and steep slope. A well-defined protocol was developed in order to conduct laboratory experiments. Rainfall was simulated with an intensity (I) of 45 mm h-1 and 67 mm h-1 on an interrill erosion plot, filled with an erodible sandy loam and having slope gradients (S) of 15% and 45%. Two palm leaf geotextiles (Borassus aethiopum and Brazilian Buriti Palm) and three simulated geotextiles (polyethylene tarpaulin) with different mesh sizes (1 x 1 cm, 5 x 5 cm and 12 x 12 cm) were tested on a simulated fine seedbed. Calculated k-values from the Horton infiltration equation ranged from 0.025-0.145 and decreased linearly on both slopes with geotextile cover percentage. Geotextiles are more effective in reducing the runoff coefficient on a medium slope (S=15%) compared to a steep slope (S=45%), ranging from 76.4-17.9%. Mean calculated b-values from the RUSLE2.0 ground cover equation, equalled 0.024 for a 15% slope and 0.045 for a 45% slope, indicating a higher effectiveness of geotextiles in reducing total interrill soil loss on gentler slopes. Induced soil surface roughness at the end of each experiment increased linearly with geotextile cover percentage and this increase was not significantly different between both slopes.