

Soil erosion significantly affects various soil properties and processes, yet its impacts on soil microbial populations remains unclear. Understanding the effects of soil erosion on soil microbial properties enables the formulation of recommendations to protect soils and reduce their vulnerability. This study aimed to determine the effects of rainfall intensity and slope on soil crusting, erosion and bacterial communities in soils with various texture and mineralogy. Three kaolinitic soils with low to medium clay content (K1, K2, and K3) and three smectite soils with high clay content (S1, S2, and S3) were subjected to simulated rainfall at three intensities (45, 70 and 100 mm/h) and two slopes (5° and 8°). Infiltration rate was measured using a graduated cylinder in 2-minute rotations of the simulator. Runoff and sediment yield were collected in a beaker. Crust strength was measured using a cone penetrometer, and its thickness was determined with a Vernier caliper. Bacterial isolates were obtained by plating serial dilutions in nutrient agar and incubating them at 25°C for 24–48 h. The phosphate solubilizing bacteria were then identified. The smectite soils formed the strongest crusts with S2 exhibiting significantly ($p < 0.05$) higher crust strength (18.54 Kpa) at an intensity of 45 mm/h and slope of 8°. On the other hand, soil K3 (kaolinitic) had the lowest crust strength (5.4 Kpa) at an intensity of 100 mm/h and slope of 8°. Soil loss increased with higher rainfall intensity and steeper slopes for the kaolinitic soils with K1 being most erodible (468.2 kg/ha) at an intensity of 100 mm/h and slope of 8°. The number of phosphate solubilizing bacteria decreased with increasing rainfall intensity. Furthermore, this study revealed that soil properties played a more significant role in shaping bacterial composition and phosphate solubilization than rainfall intensity alone. These findings highlight the complex interactions between soil erosion, bacterial communities, and soil properties, which are crucial for devising effective soil conservation strategies.