



Effect of changing wetting conditions on seal formation, runoff, and soil loss in Mediterranean soils

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In Mediterranean regions, due to the high variability of rainfall patterns, soil can be exposed to different wetting conditions before an intense rainfall event. This variation in the wetting conditions, which will be enhanced due to climate change, can affect the role of the soil properties on seal formation, runoff generation and soil loss. The present work reviews the effects of different initial wetting conditions and their interactions with soil and rain properties on seal formation, IR, runoff, and soil loss in smectitic soils, which are dominant in the Mediterranean environment.

Fast wetting of soil causes aggregate slaking, which enhance seal formation, runoff and soil loss under raindrop impact mainly in soils with >40% clay content. Increasing clay content increases aggregate strength, but at the same time increases the slaking forces. Hence, in soils with low clay contents (<40%) and low aggregate stability, the raindrop impact is sufficient to break down the aggregates and to develop a seal. In contrast, in soils with >40% clay content and high aggregate stability, slaking plays an important role in aggregate breakdown and seal formation. The importance of slaking decreased with an increase of raindrop kinetic energy from 8 to 15.9 kJ/m³. It was suggested that the effects of raindrop kinetic energy and the slaking forces on aggregates disintegration and seal formation are complementary. An increase in soil ESP from 0.9 to 20.4% decreased the effect of slaking forces on seal formation and runoff production. Probably, an increase of the ESP increased the soil dispersivity, and therefore diminished the importance of the slaking forces on aggregates disintegration and seal formation. Aging (the time since wetting) of soil favoured the stability of soil

structure, decreased the seal formation, maintained high IR, and diminished soil loss amounts. These effects of soil aging were dependant on both the prewetting rate of the soil and soil texture.