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# Soil water repellency as a vegetation-driven strategy for soil moisture sequestration in Banksia woodlands (Western Australia)

Miriam Muñoz-Rojas (1,2,3), Nicasio T. Jiménez-Morillo (4), José A. González-Pérez (4), Lorena M. Zavala (3), Jason Stevens (2), and Antonio Jordán (3)

(1) The University of Western Australia, School of Plant Biology, Crawley, 6009, WA, Australia, (2) Kings Park and Botanic Garden, Kings Park, Perth 6005, WA, Australia, (3) MED_Soil Research Group, Departamento de Cristalografía, Mineralogía y Química Agrícola, Universidad de Sevilla, Sevilla, Spain, (4) Instituto de Recursos Naturales y Agrobiología de Sevilla (IRNAS-CSIC), Sevilla, Spain

Water repellency is a property of some soils that inhibits or delays the rainwater infiltration. When a surface or subsurface soil horizon is water repellent, water is retained for periods of time that vary according to the severity of hydrophobicity, soil moisture and other parameters. Water repellency is caused by hydrophobic organic substances released by plant residues, roots or soil microorganisms. Certain abiotic agents, like fire, can increase the severity of soil water repellency in certain cases.
Under water-repellent conditions, water can infiltrate only when the pressure of the water column is high enough or when macropores allow it. These macropores may be formed by galleries excavated by animals, dead roots or gaps between aggregate or rock fragments.
Banksia plants have a dimorphic root morphology. Proteoid roots are formed by clusters of densely compacted short lateral rootlets that radiate from the parent root. These clusters spread just some centimeters below the soil surface constituting a thick dense sheet of roots and are known to secrete large amounts of organic acids and phenolics to increase the uptake of P and other minerals. In contrast, the parent root penetrates soil deeply, reaching the water table.
Sandy soils below banksia woodlands from Western Australia coastal dunes show a characteristic vertical distribution of water repellency. We observed that the first soil layer (just some millimeters of depth) was formed by a wettable sand particles transported by wind, covering a wettable or subcritically water-repellent subsurface layer (0-20 cm). A second soil layer (20-40 cm) was formed by a severely water-repellent layer with aggregates bulked by dominant banksia proteoid roots. Below this layer, soil water repellency decreased with depth until soil material rendered wettable at depths between 40 and 80 cm under field conditions.
It is hypothesized that banksia roots are capable of inducing soil water repellency, causing the occurrence of preferential flow pathways, as a way to reduce the possibility of capture of water by herbaceous plants or shrubs with shallow roots.

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