Changes in Enzyme Activities and Soil Properties in Soils With Changing Soil Water Repellency

Robert Simpson[1], Karen Mason[1], Kyle Robertson[1], Karin Mueller[2]
[1]Plant & Food Research, [2]Plant & Food Research

Soil water repellency (SWR) is a phenomenon which leads to a reduction of wetting and infiltration of soils by water. SWR is a significant problem affecting large areas of land throughout the world, and is found in natural, intensively managed and man-made ecosystems. It is generally accepted that SWR is caused by organic molecules coating the surface of soil aggregates, altering the crust to become hydrophobic. The exact nature and source of these is unknown, and possibly changes depending on soil type, location and properties. The limited understanding of the underlying causes of SWR necessarily restricts the development of management options to ameliorate the effects. The purpose of this research was to attempt to pin point a biological causal factor for SWR. To this end we looked at the interactions between SWR, soil properties and enzyme activities. Soil was collected from collected from sheep and mixed sheep and beef farms in the Hawkes Bay area, on Recent and Brown soil. Samples were collected from the same sites within each farm in November and April to see the effect of changing SWR associated with the change from early to late summer. Soil properties measured included pH, total carbon and nitrogen, mineral nitrogen, hot and cold water extractable carbon, bulk density, gravimetric water content and actual and potential hydrophobicity. The enzyme activities measured were involved in general oxidation of potential toxins, the breakdown of complex carbohydrates such as starch, cellulose, hemi-cellulose, pectin, chitin and humic acids found in plant and fungal cell walls, and the release of phosphate and sulphur found in organic molecules. Relationships between the enzyme activities and chemical/physical properties were tested statistically, to discover any correlations. These precursory results emphasize the complex nature of interactions between biological activity and physical properties found in soil.