Soil amelioration with lignite for improvement of soil properties

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# ABSTRACT

Rehabilitation and revegetation often faces a shortage of suitable (top-)soil substrate to create at least a top layer which is able to sustain vegetation. Possible threats to success are either of chemical (e.g. saline or dispersive nature of substrate) or physical nature (e.g. high clay content; high bulk density; mechanically difficult to be penetrated by roots).

In this study a clay rich subsoil from a coal mine in Victoria has been amended with lignite with the objective to understand its impact on mechanical and hydrological properties. Lignite was added to soil in concentrations of 2%, 5%, 10% and 20%. Multiple wetting and drying cycles allowed for the consolidation of samples prior to the determination of soil properties. An additional set of samples was prepared to test the response of coal to vegetation establishment (grass cover) and the impact of water stress on survival.

The following soil properties have been determined: pore size distribution, bulk density, hydraulic conductivity, plant available water, grass cover under water stress.

Results showed, that higher amounts of lignite added to the soil had positive effects by reducing the density of the soil and increasing the water holding capacity, including availability of plant available water. The water retention curve has been positively influenced, the mechanical strength has been reduced. Low concentrations of lignite amendment resulted in rather negative outcomes compared to an unamended control soil. Exposing the vegetated tests to drought conditions and severe water stress showed a longer ability of the soil to provide water for high concentration of added lignite. The improvement of physical and mechanical soil properties may also have positive effects on a chemical soil improvement.