

The performance of partially substituted composite ester materials with weathered red-bed soil in ecological restoration

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Abstract: Due to degradation and non-pollution, ester materials have become an important topic in ecological restoration; however, ester materials are artificial materials with problems such as high resource consumption and cost. Therefore, finding a scientific substitution for ester materials is key to lowering the cost. In this study, we use weathered red-bed soil to replace a portion of ester materials. We performed orthogonal coupled compounding and ecological effect tests and analyzed the soil improvement mechanism based on the mineral composition, soil structure, and electrical conductivity properties of weathered red-bed soil. The results showed that the improved soil's strength increased significantly, the rate of water infiltration increases, water retention and aeration qualities become better, as did its structure. Plant germination and height increased by 55% and 37 mm, respectively, in ratio of 15 g/m² absorbent ester material, 2.5 g/m² adhesive ester material, and 5% weathered red-bed soil, and the amount of ester material could be further lowered by 75%. The weathered red-bed soil changed the physical, mechanical, and hydraulic properties by changing the soil structure; thus, improving the ecological effects. This study provides a theoretical basis for ecological protection using weathered red-bed soil substitute for some ester materials.

Keywords: Weathered red-bed soil; Complex ester materials; Substitution effect; Mechanism; Ecological restoration