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The influence of organic amendments on soil aggregate stability from semiarid sites

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Restoring the native vegetation is the most effective way to regenerate soil health. Under these conditions, vegetation cover in areas having degraded soils may be better sustained if the soil is amended with an external source of organic matter. The addition of organic materials to soils also increases infiltration rates and reduces erosion rates; these factors contribute to an available water increment and a successful and sustainable land management.

The goal of this study was to analyze the effect of various organic amendments on the aggregate stability of soils in afforested plots.

An experimental paired-plot layout was established in southern of Spain (homogeneous slope gradient: 7.5%; aspect: N170). Five amendments were applied in an experimental set of plots: straw mulching; mulch with chipped branches of Aleppo Pine (*Pinus halepensis* L.); TerraCotten hydroabsorbent polymers; sewage sludge; sheep manure and control. Plots were afforested following the same spatial pattern, and amendments were mixed with the soil at the rate 10 Mg ha⁻¹. The vegetation was planted in a grid pattern with 0.5 m between plants in each plot. During the afforestation process the soil was tilled to 25 cm depth from the surface.

Soil from the afforested plots was sampled in: i) 6 months post-afforestation; ii) 12 months post-afforestation; iii) 18 months post-afforestation; and iv) 24 months post-afforestation. The sampling strategy for each plot involved collection of 4 disturbed soil samples taken from the surface (0–10 cm depth). The stability of aggregates was measured by wet-sieving.

Regarding to soil aggregate stability, the percentage of stable aggregates has increased slightly in all the treatments in relation to control. Specifically, the differences were recorded in the fraction of macroaggregates (≥ 0.250 mm). The largest increases have been associated with straw mulch, pinus mulch and sludge. Similar results have been registered for the soil organic carbon content. Independent of the soil management, after six months, no significant differences in microaggregates were found regarding to the control plots.

These results showed an increase in the stability of the macroaggregates when soil is amended with sludge, pinus mulch and straw mulch. This fact has been due to an increase in the number cementing agents due to: (i) the application of pinus, straw and sludge had resulted in the release of carbohydrates to the soil; and thus (ii) it has favored the development of a protective vegetation cover, which has increased the number of roots in the soil and the organic contribution to it.