

Effect of organic amendments on the afforestation performance of plant species on degraded semiarid conditions

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Abstract

The vegetation plays a fundamental role in soil conservation, so it is common to consider an increase in vegetation cover as one of the techniques to mitigate the effects of desertification in Mediterranean forest environments. There are two factors limiting the establishment and growth of seedlings in dry environments: (i) an excessive radiation and, (ii) the limited availability of water during the summer drought. During an afforestation plan, soil preparation is always necessary to reduce sapling mortality. The goal of this study was to analyze the effect of various organic amendments on soil according to chemical and hydrological properties, and to assess the effects of these parameters on an afforestation proposal under Mediterranean climate conditions.

Five amendments were applied in an experimental set of plots: straw mulching (SM); mulch with chipped branches of Aleppo Pine (PM); TerraCotten hydroabsorbent polymers (HP); sewage sludge (RU); sheep manure (SH) and control (C). Plots were afforested following the same spatial pattern, and amendments were mixed with the soil at the rate 10 Mg ha⁻¹.

Under bare soil conditions (C), most of mortalities occurred during the summer period of first year. A substantial positive effect of SM, PM and HP on the survival rates have been clearly observed. In the opposite, when soil has been amended with SH the survival quickly decrease or remained more or less constant regarding to C.

In this study, the lack of differences on chemical properties is indicating that there need to exist other reasons to justify the differences founded in the vegetation pattern. However, regarding to the hydrological properties some differences have been found.

In C, soils were registered below the wilting point during 4 months a year, and therefore, in the area of water unusable by plants. These months were coinciding

with the summer Mediterranean drought and can justify the high mortality found on plants. Conversely, in SM, PM and HP, soil moisture has stayed below the wilting point less period than C and available water for plant was also higher. In these treatments, the survival sapling rates measured were the highest. SH showed water holding capacity slightly more limited than C. For this treatment, the survival sapling rates measured were the lowest.

In conclusion, from a land management standpoint, the PM, SM and HP have been proved as a significant method to reduce the mortality sapling rates during the Mediterranean summer drought.

Key words

Afforestation, organic amendments, soil properties, restoration, degraded areas