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Soil carbon sequestration and mineralization potential in an old-field revegetated with shrubs in semi-arid climate conditions

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Revegetation and afforestation of abandoned fields can modify mineralisation processes of soil organic matter and, as a consequence, the potential for C sequestration. Our work aimed to analyse these changes identifying C fractions with different degrees of physical protection and potential mineralization, in a old-field revegetated with shrubby species in a Mediterranean semi-arid area.
A multi-specific plantation was made up in February 2006, by planting Juniperus phoenicea L. (JP), Pistacia lentiscus L. (PL) and Rosmarinus officinalis L. (RO). The area has a typical Mediterranean climate with an average temperature of 16.8 °C and a total annual precipitation of 643 mm. Soil cores were collected in three plots with a mixed specific composition, and in one plot used as control (grass cover). Soil cores (0 - 20 cm depth) were sampled in April 2010 at two distances (30 and 60 cm) from the centre of shrub crown cover in revegetated plots, and randomly in the control. The following variables were examined: soil aggregates (macro- > 250 μm and micro-aggregates between 53 and 250 μm), fine particulate organic matter (F-POM) and its C and N content, microbial respiration after 28 days at 24 °C, and mineralization rate of labile and stable C.
In the short period, no variation in soil C accumulation induced by the plantation was detected. On the other hand, C input from the different soil covers had a distinct pattern: in revegetated plots it was mainly made up by POM, while fine roots represented the major C input in the control. Macro- and micro-aggregates distribution differed in the control and revegetated plots, allowing a higher physical protection of organic carbon in the control. Nevertheless, more recalcitrant organic matter inputs in the plantation can likely determine a more robust soil C accumulation in the long term.