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The use of cover crops to increase soil organic carbon in Mediterranean vineyards

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In Central Spain the vineyards are commonly managed with conventional tillage (CT) to remove water and nutrient competition between the spontaneous vegetation and the vine plants. The continuous tillage promotes high mineralization rates resulting in soils with low organic matter content and prone to erosion. Consequently the increase of soil organic carbon (SOC) in Mediterranean soils has been a main concern in the last years. It is necessary to carry out different soil managements to enhance soil fertility and reduce erosion through the increase of SOC.

The aim of this study was to assess the capacity of cover crops (CC) to increase SOC in vineyards in Mediterranean climate. The experiment consisted in four vineyards in four different locations (different type of soil and microclimate), in the same region, to analyze the influence of CC on different conditions. A seeded CC (Brachypodium distachyon L. P. Beauv) and spontaneous vegetation were performed to compare to CT. The Brachypodium distachyon cover was seeded in December, 2012. We analyzed the organic carbon content and bulk density after three agronomy seasons. The samples were taken in the summer of 2015 at the depth of 0-5 cm.

The bulk density of Brachypodium distachyon was 1.42 t•m-3, which was statistically significant comparing to both CT (1.33 t•m-3) and spontaneous vegetation (1.34 t•m-3). The SOC percentage of CT, Brachypodium distachyon and spontaneous vegetation was 0.82, 0.96 and 1.10 respectively. Only spontaneous vegetation showed statistically significant differences compared to CT. The results were highly variable depending on the vineyard. The spontaneous vegetation was the most effective CC increasing SOC with an average of 2 t•ha-1 more than CT in three agronomy seasons.

These results point out the different efficiency of CC and the high influence of local conditions on SOC increase.