# Cover crops as bio-tools to keep soil biodiversity and quality in slopping olive orchards

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Although there are many studies assessing the influence of the use of cover crops (CC) on soil physicochemical properties, soil erosion, water availability and nutrient losses in different olive-producing areas of Andalusia (e.g., Gómez et al., 2003; Álvarez et al., 2007; Milgroom et al., 2007; Castro et al., 2008, Gómez, 2017), few studies have assessed to date the effect of different soil management systems on biological characteristics of olive orchard soils in integration with erosion measurements. Furthermore, when analyzing some soil biological and functional indicators only a few of them were evaluated (e.g., García-Ruíz et al., 2009; Sofo et al., 2010; Moreno et al., 2011; Landa et al., 2014), and there is still limited information on the effect of using CC on soil microbial community composition and biological activity.

The experiment was located in an olive orchard established (slope steepness of 11%) in a representative geographic area of Southern Spain for olive cultivation under the following soil management treatments: a CC of temporary (October to early May) grass (CC-GRA); conventional tillage (TILL) and a temporary cover crop of a mix of species CC-MIX (more details at Gómez et al., 2017). At the time of sampling, CC-GRA and TILL treatments had been in place for six years and CC-MIX for two years. Physical and chemical properties, runoff and sediment yield as well as enzymatic activities, culturable, total and active bacterial populations, and soil respiration were measured and compared to samples taken from soil in the same orchard that maintained a natural cover of spontaneous vegetation for three decades (CC-NAT).

In this study we demonstrated that the presence of a CC of raygrass reduced soil losses and maintained good soil physicochemical properties but had a small influence on the structure and diversity of different soil organisms and functional soil indicators as compared to TILL. Remarkably, the use of a mixture of plant species as a CC modified the biological soil properties of the soil and simulated or reverted those properties to a similar level to that of an undisturbed soil that had maintained a natural cover of spontaneous vegetation for three decades. The outputs of this study provide relevant information to set up a research hypothesis for the European project Soil-Man which aims to assess the ecosystem services driven by the diversity of soil biota through agricultural practices.

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