



Long-term hydrologic effect of temporary cover crops in an olive orchard on a sandy-loamy soil

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Temporary cover crops are a well established erosion control tool in Mediterranean tree crops such as olives or vines. Short-term (3-4 years) studies have established their beneficial effect in term of reducing runoff and soil losses (e.g. Gómez et al. 2009) at hillslope scale. There are few studies which have measured their hydrologic impact in the long-term. Gómez et al. (2021) in a long-term study of runoff and soil losses at hillslope scale in an olive orchard on a vertic soil noted how the reduction of runoff losses using temporary cover crops as compared to a bare soil was less than expected.

Santa Marta is a commercial olive orchard located nearby Seville, Southern Spain, with a mean slope of 11 %, with a sandy-loam textural class, and an average annual precipitation of 534 mm. In 2003, two closed runoff plots (60 long, 480 m²) where regular machine traffic during farm operations was allowed. Four additional plots where established in 2005. Since then, runoff and sediment have been collected to determine soil erosion rates, with more details in Gómez et al. (2009). In two of these plots a bare soil management, CT, implemented with regular passes (1 to 3 a year) of chisel has been maintained, while in the other four plots temporary covers controlled by mowing had been used. In 2005 and 2006 two of these plots were seeded with a mix of species, CCm, to enhanced biodiversity, while the other two plots have since the start of the experiment regularly seeded with short-term cycle annual grasses.

During the period 2003-2020 the experiment received an average annual, from 269 to 859 mm, and an average rainfall erosivity of 830 MJ mm ha⁻¹ h⁻¹ yr⁻¹, from 268 to 1750. Average annual runoff and soil losses for the CT treatment were 57.5 mm and 22.9 t ha⁻¹. For the CCg treatment the average losses were 33.8 mm 2.6 t ha⁻¹ and for the CCm 33.7 mm 2.6 t ha⁻¹ without statistically significant differences, at p<0.05 using a Kruskal-Wallis test, in runoff or soil losses between the CCg and CCm treatments. There was a significantly statistical difference in runoff and soil losses between the CT and both CC treatments. The use of temporary cover crops in an olive orchard with moderate machine traffic had a huge effect in reducing erosion, cumulative soil losses were 402.2 t ha⁻¹ in CT vs. 39.1 t ha⁻¹ in CC, while moderate in runoff, 57.1 vs. 33.5 mm year⁻¹. We discuss the temporal evolution of these differences and its implications for soil management, linking them to some soil properties analysed during this time period within the plots.

References:

Gómez, J.A., et al. 2009. The influence of cover crops and tillage on water and sediment yield, and on nutrient, and organic matter losses in an olive orchard on a sandy loam soil. *Soil and Tillage Research* 106: 137-144

Gómez, J. A., Guzmán, G. 2021. Long-term evaluation of cover crops on soil and runoff losses under trafficked conditions in olive orchards. EGU21-606, <https://doi.org/10.5194/egusphere-egu21-606>.