Geophysical Research Abstracts
Vol. 14, EGU2012-4275, 2012
EGU General Assembly 2012

Use of magnetic iron oxide to determine soil losses in rainfed olive orchard plots

G. Guzmán (1), J.A. Gómez (1), J.V. Giráldez (1,2)

(1) Instituto de Agricultura Sostenible, CSIC. Córdoba, Spain, (2) Dpto. de Agronomía, Universidad de Córdoba. Córdoba, Spain

Soil erosion is a major threat for sustainability of olive cropped areas in Mediterranean countries, like southern Spain where $\sim$17% of its surface is covered by olive orchards (Gómez *et al*. 2005). Despite the large number of research dedicated to the study of soil erosion in olive orchards, a significant uncertainty persists in the estimation of actual erosion rates in these areas (Gómez *et al*. 2008; Fleskens and Stroosnijder, 2007). Due to the technical and economic limitations of traditional methods used in erosion measurement, there is a growing interest in the use of new methods including tracking of soil incorporating tracers in experiments performed at different scales and time periods. Magnetic iron oxide particles are good tracers to complement, or even replace traditional techniques of soil loss measurement after rainfall events under controlled rainfall conditions, especially at the small scale (Guzmán *et al*. 2010).

From October 2008 to August 2010 soil losses were measured in two olive orchard runoff plots. During that period magnetic iron oxide concentration changes were also determined to estimate total soil losses and soil redistribution by water and tillage erosion in the plots, differentiating between the inter-tree rows, tree rows and rill areas influence. Average measured and estimated soil losses in the plots were 14.1 and 14.2 $kg{\cdot}m^{-2}$ respectively. Magnetic iron oxide as a sediment tracer allowed the estimation of soil losses with a RSME of 0.72 $kg{\cdot}m^{-2}$. Although soil erosion rates from tree rows were lower (0.6 $kg{\cdot}m^{-2}{\cdot}month^{-1}$) compared to inter-tree row rates (1.1 $kg{\cdot}m^{-2}{\cdot}month^{-1}$), the contribution of tree row areas to total soil losses was considerably high because of the great volume of the tree canopies in the plots and therefore, covered area (53.5 %). Magnetite content variations both overland and within the soil profile, selectivity of the tracer for finer soil particles, and soil bulk density changes, due to tillage-compaction and swelling-shrinking processes were the key factors for the precision of the estimation of soil losses. Detachment and erosion areas were identified in the plots through changes of iron oxide content in the soil. This study indicates that magnetic iron oxide can be a useful method to assess the suitability of different olive orchard management methods and to monitor sediment dynamics at a similar scale to that of the studied plots, albeit controlling with great care the factors identified in this study.

References:

Fleskens, L., Stroosnijder, L. 2007. Is soil erosion in olive groves as bad as often claimed? Geoderma 141: 260–271.

Gómez, J.A., Giráldez, J.V., Fereres, E. 2005. Water erosion in olive orchards in Andalusia (Southern Spain): a review. European Geosciences Union. Geophys. Res. Abstr. vol. 7, 08406.

Gómez, J.A., Giráldez, J.V., Vanwalleghem, T. 2008. Comments on “Is soil erosion in olive groves as bad as often claimed?” by L. Fleskens and L. Stroosnijder. Geoderma 147: 93–95.

Guzmán, G., Barrón, V., Gómez, J.A. 2010. Evaluation of magnetic iron oxides as sediment tracers in water erosion experiments. Catena 82: 126–133.