



The litter cover of citrus leaves control soil and water losses in chemically managed orchards

A. Cerdà (1), M.F. Jurgensen (2), and F.A. González-Peñaloza (1)

(1) SEDER Soil Erosion and Degradation Research Group (www.soilerosion.eu) Departament de Geografia, Universitat de València, Blasco Ibañez 28, 46010, Valencia, Spain, artemio.cerda@uv.es; felix.gonzalez@uv.es, (2) School of Forest Resources and Environmental Science. Michigan Technological University. Houghton, MI 49931. USA. mfjurgen@mtu.edu

Soil erosion in chemically managed orchards results in bare soil due to the removal of the weeds and the lack of catch crops. Those conditions results in extremely high erosion rates in citrus orchards (Cerdà et al., 2011) such it has been found in other orchards in the Mediterranean where the soil degradation trigger a change in the soil water properties (Gómez et al., 1999). The Mediterranean climatic and human conditions contribute to very active soil water erosion (Ruiz Sinoga et al., 2010) where rilling and piping are found (Romero-Díaz, 2007). It is widely known that high erosion rates can trigger the soil degradation such it has been found in vineyards (Ramos and Martínez Casasnovas, 2006), Olive (García Orenes et al., 2010) and other crops, which is related to the land management and land use (García Ruiz, 2010).

Within the chemically managed citrus orchards, the surface cover is usually bare due to the removal of the pruned branches (usually burned) and the use of herbicides every season. A thin and non-continuous litter layer of leaves from the citrus trees covers the soil surface, which sometimes are removed by the farmers to keep the soil clean. There is no information about the effect of the citrus leaves effects on soil and water losses. The objective of this paper is to quantify the effect of the leaves cover on the surface runoff and soil losses.

Experiments were conducted by means of simulated rainfall at 55 mm h⁻¹ during one hour in a small circular plot (0.25 m²) to quantify in the field the effect of different litter cover on soil erosion and water losses. An orchard of orange trees (Navel-lane-late, 10 year old, and planted at 6 x 5m with a 45 % cover) was selected in the Municipality of Montesa. Within the 2 ha field 35 plots were selected with litter covers from 0 to 100 % cover. The runoff discharge was measured every minute and each 5 minutes a sample for runoff sediment concentration was collected. The sediment concentration was measured by dessication. All the measurements were conducted during the summer (August 2008). The results show that the litter cover control the erosion processes. The orange leaves lying on the floor can reduce the soil losses to negligible values when the cover is higher than 60 %. After 20 % of litter cover the soil losses are dramatically reduced to values lower than 50 % of the soil losses under bare soil conditions. The litter cover also reduces the runoff rates, but the reduction is in 50 % for 80 % litter cover. The 20 % litter cover results only in a small reduction in the runoff discharge. The research conducted demonstrate that the farmers should maintain the leaves on the floor (do not brush them as they use to do) to control the high erosion rates.

This research study is being supported by the the research project CGL2008-02879/BTE

References

Cerdà, A., Giménez-Morera, A. y Bodí, M.B. 2009. Soil and water losses from new citrus orchards growing on sloped soils in the western Mediterranean basin. *Earth Surface Processes and Landforms*, 34, 1822-1830. DOI: 10.1002/esp.1889

García-Orenes, F., Guerrero, C., Roldán, A., Mataix-Solera, J., Cerdà, A., Campoy, M., Zornoza, R., Bárcenas, G., Caravaca, F. 2010. Soil microbial biomass and activity under different agricultural management systems in a semiarid Mediterranean agroecosystem. *Soil and Tillage Research*, 109, 110-115. 10.1016/j.still.2010.05.005

García-Ruiz, J.M. 2010. The effects of land uses on soil erosion in Spain: A review, *Catena*, 81, 1-11.

Gómez, J.A., Giráldez, J.V., Pastor, M., Fereres, E., 1999. Effects of tillage method on soil physical properties, infiltration and yield in an olive orchard. *Soil Till. Res.* 52, 167-175.

Ramos, M.C. Martínez-Casasnovas, J.A. 2006. Nutrient losses by runoff in vineyards of the Mediterranean Alt Penedès region (NE Spain). *Agriculture, Ecosystems & Environment*, 113 (1-4) 356-363.

Romero-Díaz, A., Marín-Sanleandro, P., Sánchez-Soriano, A., Belmonte-Serrato, F., Faulkner, H. 2007. The causes of piping in a set of abandoned agricultural terraces in Southeast Spain. *Catena*, 69, 282-293

Ruiz Sinoga, J.D., Romero Diaz, A., Ferre Bueno, E., Martínez Murillo, J.F. The role of soil surface conditions

in regulating runoff and erosion processes on a metamorphic hillslope (Southern Spain): Soil surface conditions, runoff and erosion in Southern Spain, *Catena*, 80, 31–139

Thornes, J.B. 1990. The interaction of erosional and vegetational dynamics in land degradation: spatial outcomes. J.B. Thornes (Ed.), *Vegetation and Erosion. Processes and Environments*, Wiley, Chichester, 41–53.