



Effect of soil type and soil management on soil physical, chemical and biological properties in commercial organic olive orchards in Southern Spain

Jose Alfonso Gomez (1), Maria Auxiliadora Soriano (2), Miguel Montes-Borrego (1), Juan Antonio Navas (1), and Blanca B. Landa (1)

(1) Institute for Sustainable Agriculture. CSIC., Agronomy, Cordoba, Spain, (2) Departamento de Agronomía. Campus de Rabanales Universidad de Córdoba. 14071 Córdoba. Spain.

One of the objectives of organic agriculture is to maintain and improve soil quality, while simultaneously producing an adequate yield. A key element in organic olive production is soil management, which properly implemented can optimize the use of rainfall water enhancing infiltration rates and controlling competition for soil water by weeds. There are different soil management strategies: eg. weed mowing (M), green manure with surface tillage in spring (T), or combination with animal grazing among the trees (G). That variability in soil management combined with the large variability in soil types on which organic olive trees are grown in Southern Spain, difficult the evaluation of the impact of different soil management on soil properties, and yield as well as its interpretation in terms of improvement of soil quality.

This communications presents the results and analysis of soil physical, chemical and biological properties on 58 soils in Southern Spain during 2005 and 2006, and analyzed and evaluated in different studies since them. Those 58 soils were sampled in 46 certified commercial organic olive orchards with four soil types as well as 12 undisturbed areas with natural vegetation near the olive orchards. The four soil types considered were Eutric Regosol (RGeu, n= 16), Eutric Cambisol (CMeu, n=16), Calcaric Regosol (RGca, n=13 soils sampled) and Calcic Cambisol (CMcc), and the soil management systems (SMS) include were 10 light tillage (LT), 16 sheep grazing (G), 10 tillage (T), 10 mechanical mowing (M), and 12 undisturbed areas covered by natural vegetation (NV-C and NV-S).

Our results indicate that soil management had a significant effect on olive yield as well as on key soil properties. Among these soil properties are physical ones, such as infiltration rate or bulk density, chemical ones, especially organic carbon concentration, and biological ones such as soil microbial respiration and bacterial community composition. Superimpose to that soil management induced variability, there was a strong interaction with soil type and climate conditions. There was also a relatively high variability within the same soil management and soil type class, indicating farm to farm variability in conditions and history of soil management.

Based on this dataset two different approaches were taken to: A) evaluate the risk of soil degradation based on a limited set of soil properties, B) assess the effect of changes in SMS on soil biodiversity by using terminal restriction profiles (TRFs) derived from T-RFLP analysis of amplified 16S rDNA as.

The results indicates the potential of both approaches to assess the risk of soil degradation (A) and the impact on soil biodiversity (B) upon appropriate benchmarking to characterize the interaction between soil management and soil type

References

Álvarez, S., Soriano, M.A., Landa, B.B., and Gómez, J.A. 2007. Soil properties in organic olive orchards compared with that in natural areas in a mountainous landscape in southern Spain. *Soil Use Manage* 23:404–416.

Gómez, J.A., Álvarez, S., and Soriano, M.A. 2009. Development of a soil degradation assessment tool for organic olive groves in southern Spain. *Catena* 79:9–17.

Landa, B.B., Montes-Borrego, M., Aranda, S., Soriano, M.A., Gómez, J.A., and Navas-Cortés, J.A. 2013. Soil factors involved in the diversity and structure of soil bacterial communities in commercial organic olive orchards in Southern Spain. *Environmental Microbiology Reports* (accepted)

Soriano, M.A., Álvarez, S., Landa, B.B., and Gómez, J.A. 2013. Soil properties in organic olive orchards following different weed management in a rolling landscape of Andalusia, Spain. *Renew Agr Food Syst* (in press), doi:10.1017/S1742170512000361.