Soil Interfaces in a Changing World

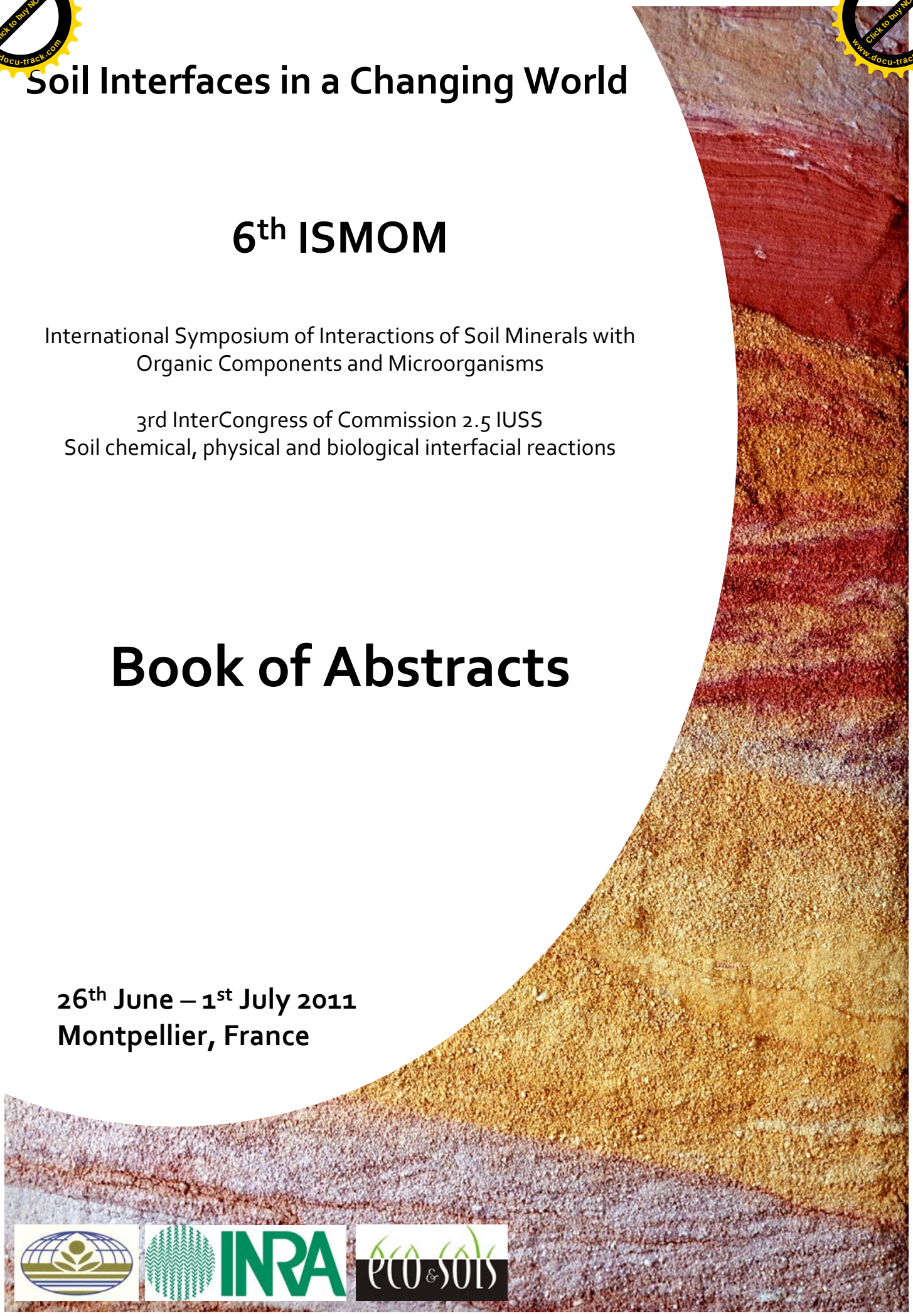
6th ISMOM

International Symposium of Interactions of Soil Minerals with Organic Components and Microorganisms

3rd InterCongress of Commission 2.5 IUSS
Soil chemical, physical and biological interfacial reactions

Book of Abstracts

26th June – 1st July 2011
Montpellier, France



Multi-parameter approach to assess short-and long-term effect of olive mill waste water land spreading on soil quality

Claudia Di Bene [1], Elisa Pellegrino [1], Marta Debolini [1], Nicola Silvestri [2], Mariassunta Galli [1], Enrico Bonari [1]

[1] Land Lab, Institute of Life Sciences, Scuola Superiore Sant'Anna, Pisa, Italy
[2] Department of Agronomy and Agro-Environmental Management, University of Pisa, Italy

The disposal of olive mill waste water (OMW) represents a relevant issue in Mediterranean countries, where the production of olive oil is large and concentrated in a short-lasting period. OMW can be used as an organic amendment in cultivated soils due to its high content of organic compounds and plant mineral nutrients. Therefore, OMW field spreading may represent a low cost and a contribution to crop irrigation in arid or semiarid climatic conditions. However, from an environmental point of view, the chemical composition of OMW might cause soil and/or water contamination. Some studies were performed aiming to evaluate the effect on crop yields and/or soil proprieties of OMW applied at different rates in controlled conditions. So far, field studies, focusing on the assessment of physico-chemical soil parameter changes after OMW application, are less. Here, we studied short- and long-term effect of OMW field spreading on soil chemical and biochemical parameters together with the impact on arbuscular mycorrhizal fungal (AMF) root colonisation. The study was carried out in two sites in Tuscany where 80 m3 ha-1, corresponding to the highest amount allowed by Italian law, was applied. The experimental layout followed the scheme of a completely randomised design with two treatments (OMW-amended soil and untreated soil as control) and four replicates. Soil and root samples were collected at zero time (T0) and 300 days after field spreading (T300). Soil samples were analysed for pH, electrical conductivity (EC), available and total P, total N, nitrates, ammonium, soil organic carbon (SOC), exchangeable K (Kexch), soluble phenols, lipids, microbial biomass carbon (MBC) and soil respiration (SR). In addition, AMF colonisation was determined on roots of collected spontaneous plant species. In T0, OMW application significantly affected EC, nitrate, ammonium, Kexch and soluble phenols, while in T300 only EC, total P and Kexch were significantly different. MBC and SR largely decreased in T0. Moreover, at both times, AMF colonisation in OMW-amended soil was significantly lower than in the control. This study confirms the positive effects of OMW on soil mineral availability, which is supported also by the fact that phenols increased only for a short-time after the application. By contrast, AMF root colonisation decrease might be related to a reduction of the beneficial effects of such important symbionts, although further studies are needed.

Presenting author: Prof. Elisa Pellegrino, e.pellegrino@sssup.it

Effect on the total and functional bacterial community in amended soils with olive oil waste

Ana Isabel Cañero [1], Leonides A. Calvo-Bado [2], Lucía Cox [1], Juan Cornejo [1], Elisabeth M.H Wellington [2]

[1] Av. Reina Mercedes, 10 - Seville - Spain
[2] Biological Sciences, University of Warwick, Coventry, CV4 7AL, United Kingdom

---

The use of pesticides in agriculture, especially herbicides, is a recognized advantageous practice all over the world. The excessive use of these compounds in soils over the last decades, have led to contamination of surface and groundwater. The addition of organic waste from olive oil production (OW) as alperujo to soils, controls the dispersion of pesticides and enhances the soil physicochemical properties. The aim of this work was to study the effect on the indigenous microbial communities of the addition of herbicide MCPA (4-chloro-2-methylphenoxy acetic acid) and alperujo to soils from Vega del Guadalquivir, Spain. Soil microcosms containing in a sandy soil (ARCO) and a loamy soil (TOCINA) amended with residue from OW production (5% and 10%) were used. Changes in the total (DNA) and functional (RNA) microbial populations were monitored using culture and culture independent methods. The major changes in the microbial population were observed in the amended soils using denaturing gradient gel of electrophoresis (DGGE)-16Sr RNA. Taxa with 99% 16S rRNA sequence similarity to Oxalobacteraceae and Janthinobacterium were found in extracts from T+OW (10%) soil before application of MCPA and 99% 16S rRNA sequence similarity to Acinetobacter were found in soils after 45 days of herbicide application. Mineralization and respiration of MCPA of unamended and amended at 5% and 10% with OW (w:w) ARCO and TOCINA soils, revealed a decrease of MCPA mineralized at the same time the CO2 produced by soil organisms is increased with the addition of OW. The addition of OW to the soil microcosms increased the microbial population using organic carbon from OW instead of the herbicide MCPA.

Presenting author: Dr. Cañero A.I. Ana Isabel Cañero Amoreti, acamoreti@irnase.csic.es

Influence of the soil type and soil management in the soil quality and soil ultramicrofabric in olive crops from Sierra Mágina, Jaén

Ulises Gutiérrez [1], Víctor Aranda [2]

[1] Dpto. Edafología y Química Agrícola, Facultad de Farmacia, Universidad de Granada, Granada, Spain
[2] Dpto de Geología, Facultad de Ciencias Experimentales, Universidad de Jaén, Jaén, Spain

---

The estimation of soil quality is a tool to assess the effects of the use and management on soil, and environmental management for maintenance of natural resources. In an agricultural context, soil quality can be engineered to maximize production in the framework of minimal environmental impact.

We have studied the quality parameters of five soils in the province of Jaén(Spain) in the region of Sierra Mágina: four of them are dedicated to the cultivation of olive tree (the province of Jaén is the leading world producer of olive oil) and the fifth is a reference natural soil (Haplic Cambisol).

Of the four agricultural soils, both have organic management (one Calcaric Eutric Regosol developed on marl and Cutanic Cromic Luvisol on limestone debris management) (a Calcaric eutric Regosol developed on marl and Cutanic CromicLuvisol on limestone debris) and others two are conventional management (a Calcariceutric Regosol developed on marl and Cromic Cutanic Luvisol on limestone debris).
From the results we can deduce that soils under organic tillage are those with higher quality (compared to natural soil and conventional management), and is especially favorable Cromic Cutanic Luvisol on limestone debris and organic management.

With regard to the quality of the parameter structure, soil Cromic Cutanic Luvisols developed on limestone debris are those that maintain a higher quality compared to Haplic Cambisol natural soil selected as reference and Calcaric Eutric Regosols on marl. From this it follows: 1) the soil quality olive Sierra Mágina is strongly influenced by the rock-forming factor, thought clearly marked trends influenced by improved organic management, despite the short time of crop implantation (18 years), and 2) the natural soil has poor quality that organic soil organic management on debris.

Also was described by SEM the different hierarchically of the soil aggregates of the conventional and organic soil uses. In the aggregate soil particles was defined the ultramicrofabric, the particle clusters and the particle domain. In the microaggregate were interpreted three images: one of the general microaggregate in 500 micras and others two of the intermicropeds area and the micropeds surface area, both in 20 micras.

We could conclude that the organic ecological management of these soils improves their quality and, therefore, would ensure sustainable agricultural production in the study area. In addition, proper management of conversion from conventional...

Presenting author: M Ulises Gutiérrez Jurado, Ulyses_1982@hotmail.com