



Effect of organic management on soil quality in geogenic arsenic rich area

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Generally, arsenic (As) concentrations in uncontaminated soils seldom exceed 10 mg/kg. Depending on the nature of sources (geogenic or anthropogenic), As concentration in soils can range from <1 to 250,000 mg/kg.

The aim of this work was to verify the effect on the tomato crop of two soil managements, organic (ORG) *vs.* conventional (CONV), on soil quality in a geogenic arsenic (As) rich area. Several soil properties were analyzed: pH, Total Organic Nitrogen (TON), Total Organic Carbon (TOC), substrate induced microbial respiration, enzyme activities, profile of the microbial community structure through ester linked fatty acid methyl ester (EL-FAME) analysis, total As and potentially bioavailable As in the tomato crop.

This study was carried out in the year 2013 during a long-term field experiment established in October 2001 at the University of Tuscia (Viterbo, Italy). The soil was volcanic and classified in the textural class as clay loam. The experimental field was arranged in a randomized block design with three replications. In the CONV samples the conventional agricultural practices were adopted, while in the ORG samples operations were carried out according to the Reg. CE N. 834/2007. A three-year crop rotation was carried out for both cropping systems, including durum wheat (*Triticum durum* Desf.), processing tomato (*Lycopersicum esculentum* Mill.), and chickpea (*Cicer arietinum* L.). In the ORG system, the crop rotations was implemented with common vetch (*Vicia sativa* L.) and oilseed (*Brassica napus* L.) cover crops, which were green manured before tomato transplanting and chickpea planting, respectively. The three main crops were present each year in the experimental field. The area of the experimental plots was 108 m² which makes it possible to carry out all farming operations with agricultural machinery in order to simulate farm conditions without animal husbandry. In both managements the maximum tillage depth was 20 cm, therefore soil samples were collected at 0-20 cm depth.

Soil tillage was carried out before tomato transplanting in May and at the same time the soil was fertilized with 80 kg ha⁻¹ P₂O₅ (using perphosphate in CONV and rock phosphate in ORG). Among the main crops, only tomato was drip irrigated to reintegrate the 90% of water lost through evapotranspiration, estimated by a class A pan and adjusted by crop coefficients during the growth cycle.

In this study, even though the content of total As was significantly higher in the ORG (65 mg/kg) than in CONV (57 mg/kg), a general improvement of the quality of the soil was observed in organic management.

Acknowledgements: We gratefully acknowledge funding from the Italian Ministry of Education, University and Research (MIUR) through PRIN project "Health of agroecosystems: chemical, biochemical and biological processes that regulate the mobility of As in the soil-water-plant compartments" (code 2010JBNLJ7_006).