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Soil conservation under climate change: use of recovery biomasses on agricultural soil subjected to the passage of agricultural machinery

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Biomass administration is a good practice to preserve the soil fertility in climate change conditions. A test regarding the use of compost derived by wine distillation residues was conducted in the coastal area sited west of Rome, on a sandy soil in continuous cropping with carrot, two cycles per year, with a consequent deep environmental impact.
The soil was fertilized with different systems: T = unfertilized soil; F = fertigation 200 kg N ha-1; FC = fertigation 100 kg N ha-1 plus half agronomic dose of compost 4 t ha-1; C2 = double compost dose 16 t ha-1; C4 = quadruple compost dose 32 t ha-1.
The functional qualities of the soil, subjected to the passage of agricultural machineries, were determined through the following parameters: bulk density, shear strength, water infiltration rate, organic matter and nitrogen content, cation exchange capacity. At the summer harvest, yield of carrots, their sugar content, firmness and nutrients concentration were determined.
The plots only amended (C2 and C4), compared to other treatments, presented lower bulk density (1.36 and 1.28 Mg m-3 respectively), higher shear strength (9 and 8 kPa respectively), as well as increased hydraulic conductivity. In these treatments (C2 and C4), in addition, occurred a higher content of organic matter (0.95 and 1.07% respectively) and nitrogen (0.11 and 0.12% respectively) and increased CEC (541 and 556 respectively) respect to the T treatment that was 521 meq 100g-1. In plots T and F, the organic matter content was reduced at the end of the field test.
The yield of carrots increased in FC, C2, and C4, compared to the other treatments. In plots C4, however, morphological changes were induced in approximately 30% of tap-roots, due to the excessive compost dose. In treatments C2 and C4 was observed a reduction of the concentration of Na in the roots, as opposed to the higher concentration of Ca and K and trace elements. The administration of compost has also induced the increase of soluble sugar content and hardness of the tap-roots.
The use of compost in right amount improved soil qualities, as evidenced by enhanced workability of the soil and increased hydraulic conductivity, which allow limiting the effects of exceptional weather events, typical of the climate change. The net balance of carbon is enhanced in these plots, providing energy and cost savings associated with increases in production, while carrots were characterized by a high quality standard, with tap-roots of good size, having increased sweetness and higher firmness.

Key words: Soil functional quality, Traffic, Compost, Carrot

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