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MESSINA
JUNE 27-29, 2018

Book Of Abstracts

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"This workshop has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 692241- MASSTWIN"

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Dynamics of Nitrogen Stable Isotope Ratio in Soil, Plant and Fruit in an Apple Orchard of Trentino: Conventional *vs* Organic Farming

***Raffaella Morelli*[1], *Federica Camin*[2], *Roberto Zanzotti*[1], *Enzo Mescalchin*[1]**

[1] Environment and Mountain Agriculture Department, Technology Transfer Centre, Edmund Mach Foundation, E. Mach Street, 1 – 38010 San Michele all'Adige (TN), Italy
[2] Food Quality and Nutrition Department, Research and Innovation Centre, Edmund Mach Foundation, E. Mach Street, 1 – 38010 San Michele all'Adige (TN), Italy

Nowadays, organic agriculture is catching on all over Italy in order to reduce the impact on human health and environment, and prevent soil degradation. We are conducting a study on an apple orchard (Gala cv.) in Valsugana (Trentino Alto Adige, Northern East Italy), with the overall aim of comparing conventional and organic agronomic management. Mineral fertilizers and pesticides are used in conventional management, conversely, animal composted manure and substances admitted in organic farming are employed in the organic one. In this investigation, we aim to identify the nitrogen source of plants in both managements. Particularly, we are studying the uptake of nitrogen sources by plants and nitrogen translocation to fruits. Nitrogen stable isotope ratio ($\delta^{15}N$) is one of the strongest markers for organic production [1]. Indeed, mineral fertilizers have a low $\delta^{15}N$ (–6 - + 6‰) because it is synthetized by atmospheric N_2. Whereas, $\delta^{15}N$ is higher in organic fertilizers than mineral ones, and varies between 1 and 37‰ [2], due to transformation mechanisms that enrich matrix in heavier nitrogen [3]. After plants uptake and metabolic processes, nitrogen preserves similar isotope ratio of absorbed products. Therefore, we can deduce the kind of nitrogen source absorbed and used by plants [4]. The experimental field has been managed with conventional agronomic practices until 2017. In April 2018 it has been divided into two plots, each subjected to one management. This experimental design includes sampling of soil and plant (leaves) every six weeks and sampling of apples on harvest for three years. Samples are being collected in ten replicates for management. We conducted a preliminary investigation of soil before fertilization (T_0), in order to assess the initial conditions. The field is quite heterogeneous in organic matter content, soil texture and carbonates. On average the soil has a good pool of organic matter and medium-high content of carbonates. Texture varies from silt loam to sandy loam. This experimentation will allow us to follow $\delta^{15}N$ dynamics in conventional and organic farming, from ground to fruit. In this way we can extend our knowledge on nitrogen isotope ratio as marker of organic products in apple crops, which has been not extensively studied. Finally we will evaluate how $\delta^{15}N$ is related with other parameters linked to fruits quality.

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