

Tomato Farming: Investigating Ramial Chipped Wood as a Fertilization Strategy

Maria Pérez^{1,2,3}, Mohamed M. Abuhabib^{1,2}, Julián Lozano-Castellón^{1,2,3}, Anna Vallverdú-Queralt^{1,2,3}, Sebastian T. Soukup⁴, Joan Romanyà^{2,3,5}, and Rosa M. Lamuela-Raventós^{1,2,3}

¹ Polyphenol Research Group, Department of Nutrition, Food Science and Gastronomy, XIA, Faculty of Pharmacy and Food Sciences, University of Barcelona, 08028, Barcelona, Spain.

² Institute of Nutrition and Food Safety (INSA-UB), University of Barcelona, 08028, Barcelona, Spain.

³ CIBER Physiopathology of Obesity and Nutrition (CIBEROBN), Institute of Health Carlos III, 28029 Madrid, Spain.

⁴ Department of Safety and Quality of Fruit and Vegetables, Max Rubner-Institut, Federal Research Institute of Nutrition and Food, Karlsruhe, Germany

⁵ Department of Biology, Health and the Environment, Faculty of Pharmacy and Food Sciences, University of Barcelona, 08028, Barcelona, Spain.

Background and objectives:

The Mediterranean diet is globally recognized for its health benefits, with tomatoes being a key component and the most consumed vegetable in this dietary pattern. Despite their cultural and nutritional importance, the agronomic performance of traditional tomato varieties under different fertilization practices remains underexplored. This study aims to examine the effects of four diverse soil treatments on the fruit quality of four local tomato varieties: Cornabel, Cuban Pepper, Corno Andino, and Roli Rosa, to optimize agronomic practices to enhance both fruit quality and overall crop performance

Methodology:

In this study, different agronomic conditions were applied to assess their effects on tomato varieties. Treatment 1 (T1) involved the application of 1.28 kg/m² of woody residue compost with a C/N ratio of 13. Treatment 2 (T2), serving as the control, used nitrogen-rich commercial organic pellets. Treatments 3 and 4 (T3 and T4) focused on incorporating ramial wood woodchips at different rates (15 kg/m² for T3 and 7.5 kg/m² for T4), followed by a no-tillage practice. To evaluate the impact of these varying conditions, metabolic profiling of the tomato samples was performed using UHPLC-QToF, followed by statistical analysis to determine treatment effects and variation across the local tomato varieties.

Results and discussion:

A total of 208 compounds were identified, with 39 showing significant variation between the tomato varieties, potentially serving as markers for differentiation. Eriodictyol was notably more abundant in the Pebroter varieties (Cornabel, Cuban Pepper, and Corno Andin), while luteolin-8-glucoside was more prevalent in Roli Rosa. Elevated levels of homovanillic acid and dopamine in the Pebroter varieties indicate enhanced activity of dopamine metabolism enzymes compared to Roli Rosa. Treatment with ramial wood fragments (T3) showed slightly higher concentrations of organic acids and amines than the application of compost (T1), as well as increased levels of individual flavonoids compared to the control (T2). These findings support the use of ramial wood by-products as an eco-friendly organic fertilizer, which can enhance the soil's physicochemical and biological properties while reducing dependence on commercial fertilizers.

Acknowledgements

This research was funded by the Ministerio de Ciencia, Innovación y Universidades (AEI/FEDER, UE) with the projects (TED2021-130783B-C21 and PID2023-146650OB-I00)

Key words:

Solanum lycopersicum, Organic farming, Woody residues, Bioactive compounds, Metabolic profiling.

Summarized Curriculum Vitae

Maria Pérez is a professor at the Torribera Food Campus and a researcher in the Polyphenol Research Group, led by Rosa M. Lamuela-Raventós. She is a member of the Royal Spanish Society of Chemistry (RSEQ), participating in the Organic Chemistry and Natural Products Chemistry specialized groups and serving on the Governing Board of the latter. In 2014, she was honored with the GEPRONAT Award for Young Researchers by the Natural Products Chemistry group of the RSEQ. She is also a member of the Institute for Research in Nutrition and Food Safety (INSA-UB), recently recognized as a Maria de Maetzu Center of Excellence, where she serves on its Board of Directors. Additionally, she is a member of CiberOBN (Pathophysiology of Obesity and Nutrition) at the Carlos III Health Institute.