Compost tea as biostimulant: promoting tomato root development

Ana Isabel González-Hernández[1,2]; Rodrigo Pérez-Sánchez[1]; María Ángeles Gómez-Sánchez[1]; María Remedios Morales-Corts[1]
Corresponding author: Ana Isabel González Hernández (aigonzalez@usal.es; ana.gonzalez@irnasa.csic.es) and M.Remedios Morales-Corts (reme@usal.es)
[1]Plant Production Group. University of Salamanca, Faculty of Environmental and Agricultural Sciences, Avenida Filiberto Villalobos 119, 37007 Salamanca, Spain
[2]Institute of Natural Resources and Agrobiology of Salamanca (IRNASA), Consejo Superior de Investigaciones Científicas (CSIC), 37008 Salamanca, Spain

INTRODUCTION

Tomato crop is one of the horticultural crop with higher economic relevance worldwide.

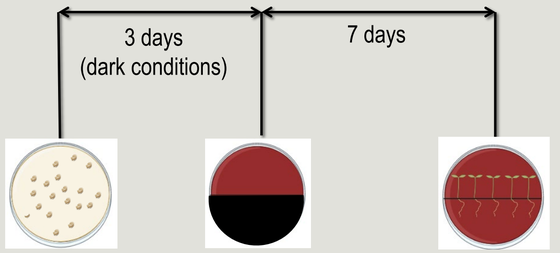
The need of enhancing food supply together with the unfavourable impact of chemical fertilizers in the environment require the study of more safe and ecological benign products. Thus, the application of **compost tea** can constitute a good approach to promote different strategies for sustainable agricultural management, since they have a natural source and their application induces plant growth.

Root modulation indicates the organization of roots in the soil, which play an important function in plant anchorage, metabolites storage and biosynthesis, and water and nutrient acquisition. Therefore, new approaches to improve root architecture constitute a good strategy to enhance nutrient acquisition.

OBJECTIVE

The goal of this study was to reveal how does the **application of CT** as potential eco-friendly organic extract **promotes root modulation** in 10-days-old tomato seedlings.

EXPERIMENTAL DESIGN



Seed desinfection and sowing in agar plates *Solanum lycopersicum* var. Tres Cantos

Seed transfer to treatments:
- Water (**W**)
- Hoagland solution (**HS**)
- Compost tea (**CT**) 1:6 ratio

Measurements and sampling in liquid N

Chemical parameters were described in González-Hernández *et al*. (2021)

Measurements of growth parameters and biochemical response:

Primary root lenght, shoot length and LR number analyses with ImageJ software

Determination of indolacetic acid, indol-3-butyric acid, zeatine, 6-benzyladenine and gibberellic acid concentration in roots by HPLC-MS

RESULTS

Chemical characteristics of CT

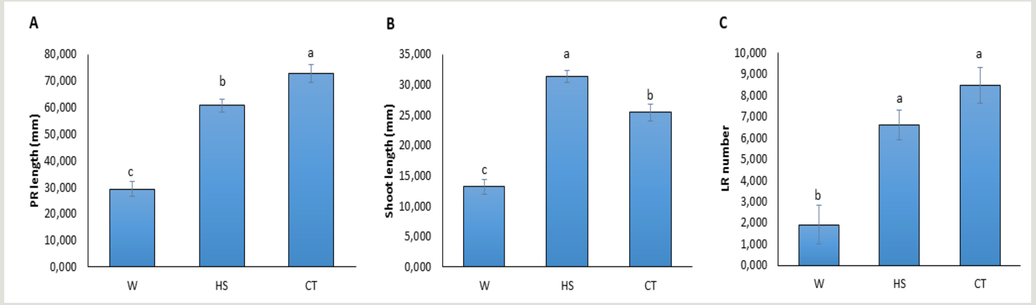
NO_3^- (ppm)*	P_2O_5 (ppm)*	K_2O (ppm)*	SO_4^{2-} (ppm)*	Ca^{2+} (ppm)*	Mg^{2+} (ppm)*	Humic acids (mg L^{-1})*	Amino acids content (µmol mL^{-1})
2240.5	61.4	2851.2	43	280	20	198	0.74

*These results were already published by González-Hernández *et al*. (2021)
González-Hernández, A.I.; Suárez-Fernández, M.B.; Pérez-Sánchez, R.; Gómez-Sánchez, M.Á.; Morales-Corts, M.R. Compost Tea Induces Growth and Resistance against *Rhizoctonia solani* and *Phytophthora capsici* in Pepper. *Agronomy* **2021**, *11*, 781.

Biochemical analyses of tomato roots

Indolacetic acid, indol-3-butyric acid, zeatine, 6-benzyladenine and gibberellic acid concentrations were not detected in roots grown under W, HS and CT treatments.

Root and shoot growth parameters



The studied green waste-based CT showed a relevant content in K_2O, N, and humic acids and, to a lesser extent, SO_4^{2-}, Ca^{2+}, Mg^{2+} and amino acids. The preliminary results showed that the chemical composition of **CT promotes primary root length and to a lesser extent LR number**, and reduces shoot length compared to HS treatment, suggesting the more pronounced effect of this treatment on roots at the first developmental stage in ten-days-old tomato seedlings. However, **no changes in the main growth regulators have been found in roots grown under any of the three considered treatments**, suggesting the **involvement of other direct or indirect pathways**.

This study provides information about the **importance of the chemical composition of the green waste-based CT in root modulation of tomato seedlings**. Further studies about the role of these safe and ecologically benign biostimulants in root modulation are required to elucidate their mode of action.

ACKNOWLEDGMENTS

This work was supported by University of Salamanca, “Caja Rural” and “Diputación de Sala-manca”. II Research Projects aimed at offering solutions to the primary sector. Project 2017/00267/001. Dr. A.I. González-Hernández holds a JCyL postdoctoral contract funded by the project CSI260P20. The Project “CLU–2019–05-IRNASA/CSIC Unit of Excellence” funded by Junta de Castilla y León and co-financed by the European Union (ERDF “Europe drives our growth”) is also acknowledged. Authors also thank to the elemental analysis, chromatography and masses service (NUCLEUS) at Salamanca University.