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High Resolution Assessment of Spatio-Temporal Changes in O_2 Concentration in Root-Pathogen Interaction

Mirco Rodeghiero[1], Simonetta Rubol[2], Alberto Bellin[3,4], Elena Turco[1], Giulia Molinatto[5], Damiano Gianelle[1] and Ilaria Pertot[1,4]
[1]Sustainable Agro-Ecosystems and Bioresources Department, Research and Innovation Centre, Fondazione Edmund Mach, San Michele all' Adige, Italy
[2]Energy Resources Engineering, Stanford University, Stanford, CA, United States
[3]Department of Civil, Environmental and Mechanical Engineering, University of Trento, Trento, Italy
[4]Agriculture, Food and Environment Centre (C3A), University of Trento, San Michele all' Adige, Italy
[5]Department of Agricultural, Forest and Food Sciences, University of Turin, Turin, Italy

Abstract:

Fusarium wilt, caused by the fungus *Fusarium oxysporum* f. sp. *lycopersici* (*Fol*), is one of the most destructive soil-borne diseases of tomatoes. Infection takes place on the roots and the process starts with contact between the fungus and the roots hairs. To date, no detailed studies are available on metabolic activity in the early stages of the *Fol* and tomato root interaction. Spatial and temporal patterns of oxygen consumption could provide new insights into the dynamics of early colonization. Here, we combined planar optodes and spatial analysis to assess how tomato roots influence the metabolic activity and growth patterns of *Fol*. The results show that the fungal metabolism, measured as oxygen consumption, increases within a few hours after the inoculation. Statistical analysis revealed that the fungus tends to growth toward the root, whereas, when the root is not present, the single elements of the fungus move with a Brownian motion (random). The combination of planar optodes and spatial analysis is a powerful new tool for assessing temporal and spatial dynamics in the early stages of root-pathogen interactions.

Keywords: fusarium, tomato, soil-borne pathogen, root respiration, planar optodes, spatial moments