



Kiwifruit Vine Decline Syndrome (KVDS) Alters Soil Enzyme Activity and Microbial Community

I. Donati¹, V. Bergamaschi^{2,3}, A. Vera⁴, L. Pirone³, J. A. Siles⁴, R. López-Mondéjar⁴, S. Vitale³, L. Luongo³, M. Reverberi², A. Infantino³, F. Bastida⁴.

¹ Zespri Fresh Produce Italy Srl, Via del Faggiolo 1/11, 40132 Bologna, Italy;

² Department of Environmental Biology, Sapienza University of Rome, P. le Aldo Moro 5, 00185 Rome, Italy;

³ Council for Agricultural Research and Economics, Research Centre for Plant Protection and Certification, Via C. G. Bertero, 22, 00156, Rome, Italy;

⁴ CEBAS-CSIC, Department of Soil and Water Conservation, Campus Universitario de Espinardo, 30100 Murcia, Spain.

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INTRODUCTION

Kiwifruit Vine Decline Syndrome (KVDS) has emerged as a multifactorial disorder affecting *Actinidia chinensis* since 2012, particularly in Central Italy. The disease is characterized by progressive canopy collapse and root rot, often leading to plant death. **This study explores the link between KVDS severity and soil health, focusing on microbial community structure and activity as potential indicators of disease onset and progression.**

MATERIALS AND METHODS

Study Area: 2 kiwifruit orchards in Lazio, Italy (Symptomatic VS Asymptomatic)

Sampling Times: Spring and Autumn 2022

Replicates: $n = 4$ per condition

Evaluation: Separate scoring for epigeal and root systems (0–3 scale: healthy to dead)

Rhizosphere Soil Analyses Included:

Soil Microbial Respiration and **Enzyme Activities**:

- Basal soil respiration
- Enzymatic activities (e.g., β -glucosidase, dehydrogenase)

Microbial biomass

- PLFAs profiling through

Microbial composition and diversity

- Amplicon sequencing (16S for bacteria, ITS for fungi)

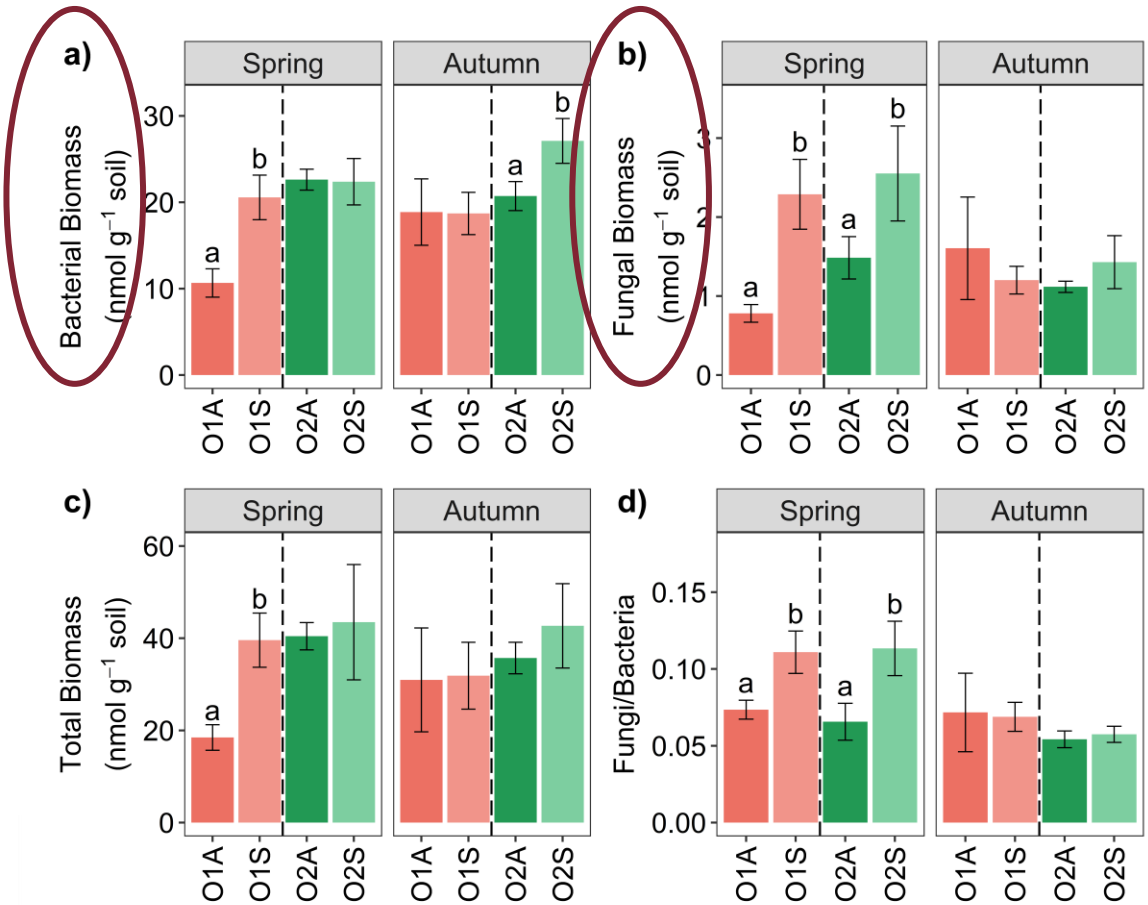
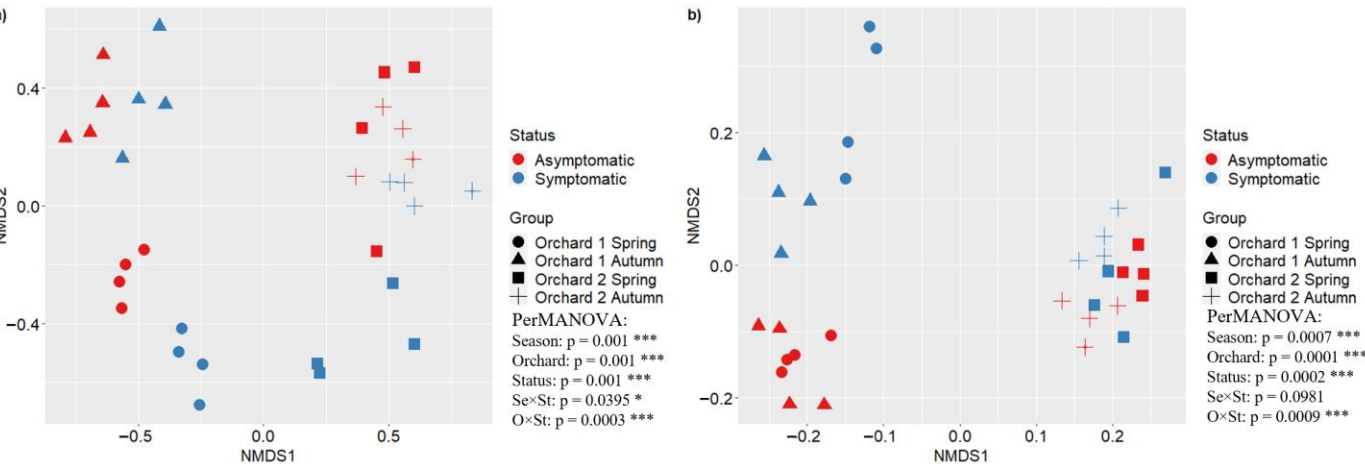


Figure 1. Sampling layout and orchard conditions. **a, c)** asymptomatic and **b),d)** symptomatic kiwifruit orchard. Detailed view of kiwifruit trees with designated sampling 5 points around the trunk .

RESULTS AND DISCUSSION

- Enzymatic Activity and Biomass:** symptomatic soil showed higher enzyme activities and microbial biomass, indicating a shift in microbial communities' composition and activity.
- Microbial Community Shifts:** specific microbial groups, notably the arbuscular mycorrhizal fungi, were significantly depleted in symptomatic soil samples.
- Soil Health:** soil microbial shift may both reflect and exacerbate plant stress, suggesting its role as a bioindicator of orchard health.

NMDS analysis of fungal community (a) and bacterial community (b) from Orchard 1 in Spring (dot) and Autumn (triangle), and Orchard 2 in Spring (square) and Autumn (cross). The asymptomatic and symptomatic samples are shown in red and blue, respectively. For the PerMANOVA test, the significance levels are shown at * $p \leq 0.05$, and *** $p \leq 0.001$. O×C means orchard and status interaction.



Bar chart of biomass abundance (nmol g⁻¹ soil h⁻¹) divided into Bacteria (a), Fungi (b), Gram- Total Biomass (c), Fungi/Bacteria ratio (d), of Orchards 1 and 2 in Spring and Autumn. Different letters (a, b) indicate significant differences based on One-Way ANOVA results at $p < 0.05$. Error bars represent the standard error of the mean (4 replicates).

Full Paper:

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