

S4T1**Soil microbiome regulates trade-offs between productivity and disease pressure for circular growth media**

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Abstract

Peat is the predominant growth media in horticulture, despite its large ecological footprint. Modern cropping systems rely heavily on dynamic interactions of the host with microorganisms in the growth media. Yet, the microbiome of the growth media has been largely ignored, in the search for sustainable peat-alternatives. Ecological disease control strategies also suffer from a primitive understanding of the resident microbiome.

In this research, we explored the microbial diversity, activity, composition and interactions of four circular and sustainable alternatives in horticultural growth media, that were used to replace peat. We simultaneously evaluated their physico-chemical properties and agronomical performance. We found peat-based growth media to be a prime determinant of both productivity in the cropping system, as a supplier of beneficial microbes.

Peat-alternatives from agricultural residue streams comprised a unique and competitive microbiome, which produced lower yields. However, it also offered an increased invasion resistance to the cropping system due to niche specialisation within the community, and could defer the establishment of both pathogens and bioinoculants. Sanitary treatment of the peat-alternatives by acidification or steaming significantly increased the yield, while reducing the complexity of the resident microbiome, as well as the presence of endemic pathogens.

In conclusion, circular growing media harbours both harmful and beneficial microbes. The bacterial and fungal microbiome of the growth media governs trade-offs between the productivity and disease pressure in circular horticulture. The success of circular and pesticide-free horticulture can benefit greatly from management of the resident microbiome of growth media.

