

Molecular features and disease suppressive activity of organic fractions extracted by green composts

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Abstract

Composting is a viable technology to process bio-wastes and organic biomasses through a controlled aerobic microbial process that promotes an effective sanitization and biochemical stabilization of organic matter (Ballardo et al., 2020). Horticultural crops and agro-industrial productions provide significant amounts of residues and by-products that are important sources of carbon, nutrients and potential bioactive components (Spaccini et al., 2019). Besides the conventional use of compost as soil amendment and fertilizer, the bulk compost and the extractable fractions are reckoned to act as either plant biostimulants or disease suppressive compounds (Pane et al., 2016). The main objective of this study was the evaluation of potential plant disease suppressive properties of two green compost obtained from olive residues and coffee processing wastes, determining a possible relationship between their molecular features and bioactivity. Various organic fractions as humic substances HS, Compost tea, CT, aqueous fraction DOM, and lipid compounds have been isolated by different extraction methodologies. The molecular composition of bulk composts and derived fractions have been analyzed by ¹³C CPMAS NMR, thermochemolysis GC- MS and Folin Ciocalteu assay (Verrillo et al., 2022). The suppressive activity was tested with an in vivo assay on the pathosystem *Fusarium oxysporum* f.sp. *raphani*/wild rocket (*Diplotaxis tenuifolia*) (Navarro et al., 2022) by evaluating the potential to induce systemic resistance (ISR) in the plants. Moreover, antioxidant features and antibacterial properties on human microbial strains have been carried out to propose a possible additional applications of compost extracts in pharmacology and nutraceuticals fields. The in planta assays have shown for both biomasses a greater suppressive activity against wild rocket tracheofusariosis for the bulk Composts, followed by and HS fractions. Conversely, the evaluation of antioxidant

properties and antimicrobial assays have shown that HS and CT extracts from olive compost induce a suppressive effect on pathogens related to human health. The combination of molecular characterization and biological data suggest the occurrence of a structural-activity relationship between structure through different modalities of mechanisms of inhibition or resistance induction. In particular, for plant pathogens the bioactivity seems related to the interaction of plant roots with either the polar fractions such as oligosaccharides and peptides or to the complex amphiphilic fractions, while the lignin and phenolic derivatives were correlated with antioxidant activity and inhibition growth of multi drug resistance human pathogens.

Keywords: compost, recycling biomasses, agricultural wastes, suppressive disease, molecular characterization

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