



Title: Phenolic Acids Aggravate Crops Continuous Replanting Problems by Regulating Their Allelopathic Effects on Plants and Microorganisms: A Case Study on Lily

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We reported the phenolic acid components, microbial community structure, and soil physicochemical properties in the rhizosphere soil of a type of food lily named lanzhouliy (*Lilium davidii* var. *unicolor*) under 0-9 years of continuous cropping. The results showed that long-term continuous cropping significantly increased the total phenolic acid content in the soil, with remarkable changes in key components such as phthalic acid and p-hydroxybenzoic acid. Redundancy analysis (RDA) and principal component analysis (PCA) indicated that phenolic acid composition was closely associated with continuous cropping duration and plant growth stages, and significantly affected the structures of bacterial and fungal communities. Functional prediction analysis demonstrated that continuous cropping related bacterial metabolic pathways in terms of phenolic acid degradation (e.g., xylene degradation, ethylbenzene degradation), while in fungal functional groups, the proportion of pathogenic fungi increased and that of saprophytic fungi decreased. In vitro culture experiments confirmed the allelopathic effects of specific phenolic acid components on *Fusarium oxysporum* (the primary pathogen causing lily fusarium wilt): p-hydroxybenzoic acid inhibited pathogen growth at high concentrations, whereas phthalic acid promoted its proliferation at low concentrations. Additionally, phthalic acid exhibited a negative correlation with the abundance of the beneficial bacterium *Sphingomonas*, further impairing soil microecological functions. We concluded that phthalic acid and p-hydroxybenzoic acid regulate pathogens and beneficial microorganisms through allelopathic autotoxicity, synergistically exacerbating soil-borne diseases and plant autotoxic effects, and thus serve as the key soil allelopathic factors leading to continuous cropping obstacles in lily.

Biography

Guiying Shi has completed her PhD at the age of 33 years from Gansu Agricultural University and has been this University School of vegetables for 20 years. She is the professor in Gansu Agricultural University, and she is majoring in vegetables cropping in freindly enviroments published more than 40 papers.

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