

# Postharvest-induced microbiota remodeling increases fungal diversity in the phyllosphere mycobiota of broccoli florets

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## Abstract

Fresh vegetables harbor numerous microbial populations in their phyllosphere. The phyllosphere microbiota is important not only for enhancing crop production, but also maintaining the quality and safety of fresh vegetables. However, studies of fungal communities on fresh vegetables are lacking, and very little is known about changes to fungal communities after harvest. This study explored the phyllosphere mycobiota of broccoli florets collected from 14 farms (n = 42, preharvest) and 10 retail stores (n = 40, postharvest) by culturing and amplicon sequencing of an internal transcribed spacer region. Core genera were identified that were specific to the broccoli phyllosphere. Fungal populations exceeded bacterial populations in both total abundance and biodiversity, and fungal communities differed much more between preharvest and postharvest samples than bacterial communities. The fungal variance explained by postharvest (25.4 %) was larger than the variance by farming region (10.9 %) or practice (10.9 %), but the bacterial variance by postharvest (3.5 %) was lower than that by farming region (19.5 %) or practice (9.5 %). Both species richness and evenness were significantly higher in postharvest samples, and the *Ascomycota*-to-*Basidiomycota* ratio was significantly lower in postharvest samples than in preharvest samples. Microbial association network analysis illustrated that preharvest interspecies interactions involving *Purpureocillium* and *Cystofilobasidium* were replaced with interactions involving *Sporobolomyces*, *Papiliotrema*, and *Bulleromyces* in postharvest samples, resulting in a decrease of network robustness, as corroborated by functional changes and enrichment of a postharvest pathogen. Overall, the fungal community is an important component of postharvest microbiome in the phyllosphere of fresh vegetables that has large potential impacts on fresh produce storage and spoilage.