

Diversity and composition of rare bacterial community in gut and vermicompost of *Eudrilus eugeniae* fed with multiple substrates during vermicomposting

Abstract

Vermicomposting has been recognized as a sustainable solution for the managing of organic waste, primarily because of the bacterial communities that drive microbial decomposition. However, while the roles of abundant bacteria in composting processes are well-documented, the contributions of rare bacteria remain underexplored. In this study, we investigated the diversity and composition of abundant and rare bacterial communities in gut of *Eudrilus eugeniae* and resulting vermicompost, comparing okara as a single substrate compared to a combination of more substrates, such as kitchen waste or okara and kitchen waste. Amplicon sequencing revealed a total of 3085 operational taxonomic units (OTUs), comprising 188 abundant OTUs and 2127 rare OTUs. Significant differences in bacterial community composition were observed between vermicompost and the earthworm gut, particularly in the rare bacterial communities, with distinct abundances of Gemmatimonadota, Desulfobacteria, Myxococcota, Acidobacteria, and Firmicutes. Interestingly, no significant differences were found between treatments in the abundant bacterial communities, suggesting that okara alone can sustain a bacterial community comparable to mixed substrates. However, rare bacterial communities were more sensitive to substrate variation, with okara fostering distinct rare microbial populations in the vermicompost and earthworm gut. Our results indicate okara can support both abundant and rare bacteria, producing compost with similar physico-chemical properties to those derived from mixed substrates. The study highlights the importance of rare bacterial communities in vermicomposting and demonstrates the potential of okara as a valuable resource for sustainable waste management and soil improvement.

Keywords

Amplicon sequencing; *Eudrilus eugeniae*; Microbial diversity; Okara; Rare bacteria; Vermicomposting