Soil Microbiome During Corn Production as Influenced by Soil Order and Nitrogen Fertilization

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Abstract

Maintaining a healthy soil microbiome is important for key soil functions and plant growth. However, little is known about temporal changes in soil microbial communities across different soils and nitrogen fertilization in production soils. The aim of this investigation was to determine soil bacterial and fungal baseline communities and seasonal changes in cornfields, under contrasting soil orders with and without nitrogen fertilization. Three Missouri soil orders (Entisol, Alfisol, and Mollisol) and two nitrogen fertilizer rates (0 and 225 kg nitrogen ha-1) were used for this research. Soil samples (0-5 and 5-15 cm) were taken six times during the season, starting prior to planting up to the R2 corn growth stage. Samples were used to determine bacterial and fungal abundancies and biomass. Soil characteristics (e.g., CEC, pH, organic matter) and nitrogen fertilization showed significant but minor influence on bacterial abundance and biomass, while soil order and corn growth stage had major influence. Each soil order had a distinct and significantly different bacterial and fungal community. Soil depth significantly influenced all Beta diversity metrics, and bacterial and fungal biomass were greater in the 0-5 cm depth. No microbial interactions influenced corn growth more than nitrogen. Though strong relationships between microbes and soil and plant health have been shown, linkages of microbiome information to agronomic decisions are rare. Before developing soil microbial information based decision aids for farmers, longer temporal sampling in more growing environments are needed to identify links between management practices and microbial information.

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