
LEGUME CROP ROTATION SUPPRESSED THE NITRIFYING MICROBIAL COMMUNITY IN A SUGARCANE CROPPING SOIL

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Abstract

NITRIFICATION INHIBITION IS a promising management strategy to mitigate the loss of soil nitrogen (N) through nitrate (NO₃⁻) leaching and denitrification, particularly in high rainfall regions.

Legume crop rotation in sugarcane farming systems can improve soil health, but its effects on nitrifying microorganisms in soil are not well understood.

Using shotgun metagenomic sequencing, we investigated the impact of two legume break crops (peanut and soybean) on the nitrifying microbial communities in sugarcane cropping soils. Both peanut and soybean cropping altered the soil bacterial and archaeal community composition but did not significantly change species richness and evenness.

The abundance of bacteria and archaea increased by 1.6 and 2.0 times under peanut and soybean cropping, respectively, while abundances of the ammonia oxidisers were 20–23% lower in the legume cropped soil relative to the bare fallow.

Furthermore, abundances of the gene encoding ammonia monooxygenase (*amoA*) in the peanut and soybean treatments were only 40–43% of that in the bare fallow. Consistent with these findings, higher ammonium and lower nitrate concentrations were observed in the legume cropping soils compared with the bare fallow.

These results warrant further investigation into possible changes in soil nitrification capacity and nitrate losses from soil during the fallow period and the subsequent cropping season.