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Do Mycorrhiza Play a Role in the BNI Performance of *Brachiaria humidicola*?

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Abstract

The tropical forage *Brachiaria humidicola* (Bh), a plant with recognised Biological Nitrification Inhibition (BNI) potential, has been acknowledged as a model crop to investigate the BNI phenomenon. BNI is originally thought to be an allelochemical phenomenon, that inhibits the activity of soil nitrifying bacteria and archaea. Our studies on BNI have revealed, however, that also inter-microbial competition for nitrogen might play an important role in BNI. Recent research suggested that besides heterotrophic bacteria and archaea also symbiotic arbuscular mycorrhizal fungi (AMF) in the direct vicinity of the plant roots may contribute to the immobilisation of ammonium (NH_4^+) leading to low nitrification rates in Bh pastures. It must be emphasised that until now no in-depth research on the role of AMF in BNI has been published.

To fill this knowledge gap, the presented research was conducted at the end of a two-factorial pot experiment with the factors soil type (three different soils) and Bh genotypes (three genotypes with different BNI activity). The potential role of AMF for BNI was investigated in topsoil (0–10 cm) and roots collected 14 days after NH_4^+ fertilisation. Various indicators for the BNI performance (nitrate formation in soil solution, abundance of ammonium oxidising bacteria and archaea (AOB and AOA) and N_2O emissions have been measured before and after the fertilisation event. In the next step, colonisation of AMF on Bh roots was assessed via root staining techniques. Total abundance of mycorrhizal fungi in soil was quantified via qPCR techniques using the AMF specific primer developed by Krüger et al. 2009 and community composition of AMF was assessed by denaturing gradient gel electrophoresis (DGGE) analysis using DNA extracted from the roots. The combination of classical and molecular techniques to study AMF dynamics will allow answering the question to what extent AMF may play a role in the BNI performance of different Bh genotypes.

Keywords: Arbuscular mycorrhizal fungi, biological nitrification inhibition, *Brachiaria* grasses, denaturing gradient gel electrophoresis, mycorrhizal symbiosis, qPCR

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