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ABSTRACT BOOK

PP029

EVALUATION OF THE IMPACT OF SYNTHETIC AND BIOLOGICAL NITRIFICATION INHIBITORS ON THE COMPOSITION AND ACTIVITY OF THE SOIL MICROBIAL COMMUNITY AND THE EMISSIONS OF GREENHOUSE GASES

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Nitrification inhibitors (NIs) delay the microbial conversion of ammonium to nitrate (nitrification), reducing the risk of N loss through leaching (in the form of NO_3-/N) or denitrification (emissions of nitrous oxides like N_2O), and thereby increasing the N use efficiency (NUE) of fertilizers and reducing the detrimental environmental effects of the reactive nitrogen (Nr) cascade. To date, little is known regarding the effect of nitrification inhibitors (NIs) on the metabolic activity of the different groups of soil ammonia-oxidizing microorganis (AOM). Within the framework of the European Union's Horizon 2021-2027 research and innovation programme ACTIONr we aim to investigate the complex interactions of NIs with N cycling microbial players both at functional and community structure level with ultimate goal to establish new tools and pathways to optimise NUE, decelerate the N cycle, and decrease the environmental footprint of Nr. To this end, the effect of selected synthetic and biological NIs, applied individually or in mixtures targeting either different parts of the ammonia oxidation pathway or different groups of AOM, is investigated in soil microcosm and pot experiments, under a range of conditions known to affect the activity of soil AOM and the performance of NIs (e.g., soil pH and N fertilization type). Our assessment will expand to other microbial groups directly (e.g., denitrifiers fuelled by substrates produced during nitrification) or not directly associated with nitrification (e.g., bacteria, fungi, viruses, protists) gaining insights into the effects of NIs on the community composition and activity of off-target soil communities and highlight possible interrelated effects of NIs on broader cross-kingdom networks. Gas emission rates of CO_2, CH_4 and N_2O will be measured in parallel to gain insight of the impact of NIs on nitrifier and total microbial contributions to GHG emissions. Overall, our work is expected to enable a deep understanding on the complex interactions between NIs and soil nitrifying microorganis, which in the short term could be harnessed for the development of innovative fertilization products, while in the long-term it will contribute to more efficient N management in agricultural settings.

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