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ABSTRACT BOOK

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PLANT TRITERPENOIDS AS NOVEL BIOLOGICAL NITRIFICATION INHIBITORS WITH ARCHAEAL SELECTIVITY

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Biological nitrification inhibitors (BNIs) offer a sustainable strategy to enhance nitrogen use efficiency and reduce nitrogen losses in agriculture. In this study, we evaluated the nitrification inhibition (NI) potential of 18 plant-derived triterpenoids using in vitro assays with soil ammonia-oxidizing bacteria (AOB) (Nitrosospira multiformis, Nitrosomonas ureae) and archaea (AOA) (Nitrososphaera viennensis, Nitrosotalea sinensis) at two concentration levels (5 and 20 mg L^{-1}). Our results revealed that triterpenoids were highly effective against AOA, outperforming sakuranetin, a known BNI exuded by sorghum (Sorghum bicolor) roots, while showing limited activity on AOB. Six triterpenoids achieved high levels of AOA inhibition (74–100%), with 3-O-acetyl-11-keto-β-boswellic acid emerging as the most potent (ammonia oxidation inhibition >96%), followed by 11-keto-β-boswellic acid, echinocystic acid, asiatic acid, and ursolic acid. Interestingly, the strong inhibition of AOA by certain triterpenoids may be linked to their known suppression of 3-hydroxy-3-methylglutaryl-CoA reductase (HMGCR), an essential enzyme in archaeal membrane biosynthesis. This suggests a broader archaeal-specific mechanism that warrants further validation. Overall, this study highlights the potential of plant-derived triterpenoids as selective BNIs, contributing to the development of bio-based strategies for sustainable nitrogen management in agriculture.

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