

Kinetics of Nitrification in Ammonium-Saturated Clinoptilolite. (S03-mcgilloway120308-Oral)

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Abstract:

Clinoptilolite is a clay mineral with high cation exchange capacity that has been saturated with ammonium for use as a substrate for growing plants or as a fertilizer source. The production of nitrite and nitrate, and nitrifier populations in zeoponic substrates were evaluated. Columns were filled with substrate, inoculated with a commercial inoculum or soil enrichment culture of nitrifiers, and nitrification rates were determined. In addition to column studies, a growth chamber study was conducted to evaluate nitrification kinetics in substrate used to grow radishes. The zeoponic substrate provided a readily available source of ammonium for nitrification. Ammonium oxidation rates in column studies ranged from 0.005 to 0.01 mg N g⁻¹ substrate h⁻¹, and nitrite oxidation rates were 0.002 to 0.0095 mg N g⁻¹ substrate h⁻¹. Rates determined from the growth chamber study were 0.0012 mg N g⁻¹ substrate h⁻¹. Acidification as a result of ammonium oxidation resulted in pH decline. Quantities of ammonium oxidized to nitrite and nitrate in inoculated zeoponic substrate were in excess of plant up-take. Nitrification in clinoptilolite may need to be inhibited to prevent excessive amounts of nitrite and nitrate in solution and build-up of acidity.

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