

Lack of Nitrite and Reduced Nitrate Formation in Side-Banded Urea Treated with the Nitrification Inhibitor Nitrapyrin Linked to Decreased N₂O Emissions

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Nitrification inhibitors and subsurface banding are valuable tools for reducing nitrogen losses. However, field studies on the transformation products of banded nitrogen are limited. The study shows how a nitrification inhibitor, nitrapyrin (eNtrench), affects nitrogen transformation in lateral and vertical directions from side-banded urea and N₂O fluxes in a field at the Ian N. Morrison Research Farm, MB. Treatments included side-banded urea, urea+NI, and a control. Soil samples were collected using a custom grid. N₂O fluxes were measured using static-vented chambers. The lateral diffusion of ammonium was highest on day 5, (5–6 cm from the band), and 8-9 cm vertically. Laterally, nitrate distributed up to 8 cm from the band, while vertically, it was still detected 10 cm below the band. Ammonium concentration peaked on day-3 (800 mg N/kg) and was higher under NI treatment, whereas nitrate was higher in the urea without NI, peaking on day-15 (400 mg N/kg); indicating the inhibitor slowed ammonium transformation. The maximum nitrite accumulation (80 mg N/kg) in urea without NI appeared a few days before N₂O emissions, suggesting an important role of nitrite in driving N₂O emissions. The study shows that nitrapyrin effectively reduces the accumulation of nitrite and nitrate in side-banded urea, lowering N₂O emissions.