

Farm-scale Research on Stabilization of Fall Anhydrous Ammonia in Manitoba

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Fall-applied anhydrous ammonia (AA) is susceptible to nitrification losses in the soil by the time of the next growing season. Three farm-scale research trials were conducted in Southern Manitoba to test and compare the effects of the application of nitrification inhibitors (NIs) (N-Serve and Centuro) with AA on slowing down the nitrification over-winter, and in improving yields and nitrogen (N) recovery from spring-sown crops. First trial was initiated in the fall of 2020 at Silverwinds (SW), while two trials were conducted in the fall of following year at the Notre-Dame (ND) and Manitou (MN) sites. Nitrogen was applied in late fall as AA (82-0-0) at 80% of the recommended N rate (based on soil test and target yield) with and without NIs. Additionally, treatments without N addition (as a control) and with 100% of the full recommended N rate were also included. Extractable N as ammonium ($\text{NH}_4^+\text{-N}$) and nitrate ($\text{NO}_3^-\text{-N}$) concentrations (mg N kg^{-1} dry soil) were obtained for the soil sampled (0-30 cm, both on and between the band rows) in late fall, early, and late spring for all three sites. Overall, at each site, we observed an average increase in $\text{NH}_4^+\text{-N}$ retention within the bands (8.9, 8.9, and 51.4 mg kg^{-1} dry soil) when compared to untreated NH_3 (2.9, 5.5, and 32.1 mg kg^{-1} dry soil). Additionally, the application of N-Serve and Centuro led to a reduction in $\text{NO}_3^-\text{-N}$ accumulation between the bands until late spring (21.3, 8.4, and 9.8 kg^{-1} dry soil) compared to untreated NH_3 (29.8, 8.7, and 22.4 kg^{-1} dry soil) at SW, ND, and MN sites, respectively. However, no notable differences in agronomic yield and N uptake were observed with N-Serve and Centuro for wheat and canola crops at ND and MN sites, respectively.