Utilizing manure as a nitrogen source for winter wheat has proven to be challenging. Nitrogen losses from surface-applied manure can be substantial. Micro-ponding and soil “sealing off” when manure is applied all add to the challenge of maximizing manure utilization and reducing environmental losses. In Ontario, a two-year project examined methods to reduce nitrogen volatilization and improve utilization by improving uniformity of application of liquid manure into winter wheat stands in early spring. The concept being investigated is the European methodology of “Low-Disturbance Shallow Injection” technology.

Methods

Two replicate field-scale trials were completed at nine locations (four in 2012 and five in 2013). The treatments are as follows:

1. Check (no manure or fertilizer)
2. Full-rate manure shallow injection
3. Full-rate surface band-applied manure
4. Full-rate splash plate applied manure
5. Two-thirds rate manure injection and one-third rate fertilizer
6. Full-rate fertilizer

Manure was applied on winter wheat fields in late March in 2012 and early May in 2013.

Treatment 2 was injected using a Veenhuis injection unit with V-style press wheel openers at 7.5-inch spacing in 2012 and a modified coulter injector on 10-inch centers (Nuhn Industries) in 2013. Veenhuis openers create a narrow trench 1 to 2 inches deep into which the manure is applied, while the Nuhn toolbar was considerably more aggressive, running up to 4 inches deep to create a void for the manure to be delivered into.

For Treatment 3, the surface band manure treatment was applied by raising the openers out of the ground and applying the manure on the surface via the same band applicator used in Treatment 2 so that the manure was applied in 7.5-inch spaced bands. The manure did not cover the entire soil surface.

For Treatment 4, the manure was applied broadcast via a splash plate that resulted in the entire soil surface being covered. Due to equipment limitations in the early season, the splash plate treatment was included at only one location in 2012 and four of the five sites in 2013.

In Treatment 5, manure was injected in the same manner as Treatment 1, but the rate was cut by one-third. Urea fertilizer was then broadcast on the soil surface using a Valmar airflow applicator at a rate to replace the N not available in the lower manure rate. This low rate of fertilizer N should help overcome any manure application uniformity issues.

With Treatment 6, urea fertilizer was broadcast to match nitrogen levels on manure treatments. Potash and phosphorus applied from manure were not matched in the full fertilizer treatment.

Ammonia loss was measured across all treatments via dosimeter tubes and pails adapted to allow for airflow after ammonia movement was measured. Soil nitrate levels were taken at heading and post-harvest to track soil nitrogen status and monitor potential environmental impact post-harvest. Disease levels were monitored throughout the growing season. Harvest measurements...