

## **The Role of Enhanced Efficiency Fertilizers in Nitrogen Fertilization**

There are three major losses of nitrogen from the soil-plant system, namely, volatilization, denitrification and leaching. The presentation will concentrate on the first two with more emphasis on denitrification.

When it comes to volatilization, i.e., the loss of nitrogen to the atmosphere as ammonia gas ( $\text{NH}_3$ ), of urea-based fertilizers several practices are recommended, such as the use of urease inhibitors, slow-release forms and irrigation shortly after application. However, going back in history the most common practice in western Canada has been deep-banding of nitrogen fertilizers. However, with the size of farms on constant increase shallow banding and broadcasting have been expanding. A number of factors will contribute to volatilization, such as moist soil, heavy dew, or high humidity, low amounts of rainfall, wind, high soil pH ( $>7.0$ ), high soil temperature ( $>10\text{ }^\circ\text{C}$ ) or frozen soil, crop residue, perennial thatch or sod, low cation exchange capacity soil (sandy), poorly buffered soils (low soil organic matter, coarse textured, low bicarbonate content). The use of enhanced efficiency fertilizers (EEF) can be instrumental in reducing volatilization losses.

Denitrification losses have been shown to occur both during spring under a number of circumstances including snowmelt and under wet conditions. Factors affecting denitrification include soil pH, moisture, temperature, aeration and plant residue. A number of practices have been implemented to minimize losses, such as proper rates and sources - best placement and proper timing, nitrification inhibitors (to slow the conversion of  $\text{NH}_4^+$  to  $\text{NO}_3^-$ ), slow-release N fertilizers in an attempt to release N over the growing season, matching availability and crop needs).

A number of products are in the market to address the above and their use, the duration of protection offered and effectiveness, where available, will be discussed.