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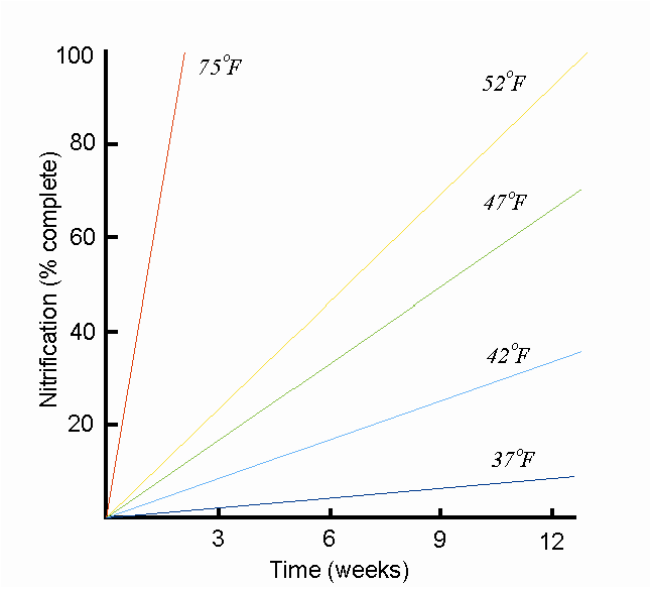
Nitrogen Fertilizer – How Much is Left?

Significant rainfall in parts of Nebraska over the past three weeks has many producers wondering how much of the nitrogen (N) fertilizer they applied is still available to the crop. There are several factors which will influence the amount of N loss, including rainfall amount and intensity, soil texture, soil temperature, fertilizer source and application date. Loss pathways can include runoff, ammonia volatilization, denitrification and leaching.

Runoff - If fertilizer had been recently applied to the soil surface without incorporation or gentle rain of ½ inch or more to move N into the soil profile, substantial N loss may occur in runoff associated with intense rainfall.

Ammonia Volatilization - Nitrogen supplied from urea-based fertilizer (urea or urea-ammonium nitrate solution [UAN]) can be lost as ammonia gas to the atmosphere under certain conditions. The greatest risk is from fertilizer broadcast to warm, moist soils with heavy residue. Rainfall of ½ inch or more generally is adequate to move fertilizer into the soil and protect it from ammonia volatilization. Very light rains, of ¼ inch or less, may only moisten the residue and soil, increasing loss rather than preventing it.

Denitrification - The primary N loss mechanism from saturated, fine-textured soils is likely denitrification. This is the process of conversion of nitrate-N into gaseous forms (nitric oxide, nitrous oxide, dinitrogen) by anaerobic bacteria present in the soil. These gaseous forms of nitrogen can be lost to the atmosphere. In fields where the majority of fertilizer N was applied before planting, likely 4-8 weeks ago, much of the N may have been converted to nitrate by the microbial process of nitrification. This nitrate is then susceptible to loss via denitrification or leaching.



Leaching

If nitrogen existed in soil in the nitrate or urea forms, significant leaching loss can occur with heavy rains, more-so on coarse-textured soils. Some of this N may have leached deep enough into the root

zone to be unavailable to the crop, at least early in the season. Continued precipitation or irrigation may leach this N out of the root zone entirely.

For more information on soil processes influencing N management, see Nutrient Management for Agronomic Crops, EC-155 (http://www.ianrpubs.unl.edu/sendIt/ec155.pdf)

Management Options - Unfortunately, there are many variables interacting to influence the potential for N loss, making it difficult to estimate how much fertilizer N has been lost, and if producers should apply more fertilizer. Research in Iowa suggests approximately 4-5% of nitrate-N can be lost via denitrification for each day that soils are saturated. Figure 1 can be used to estimate the rate of conversion from ammonium to nitrate following anhydrous ammonia application. For anhydrous ammonia applied 6 weeks ago, perhaps at least 50% of the N has been converted to nitrate. If soils were saturated for five days, as much as 10-12% of applied N may have been lost to denitrification, with additional potential loss due to runoff or leaching. Whether remaining N will be adequate to optimize yield potential depends on the initial application rate, and growing conditions during the rest of the season.

Soil sampling is one option to evaluate how much nitrogen remains available. The pre-sidedress nitrate test (PSNT) is used to evaluate N availability resulting from fertilizer residual nitrate-N and early season N mineralization from soil organic matter. Beginning when corn plants are 6-12 inches tall, collect soil samples to a depth of one foot, compositing at least 12-15 cores from the area of interest into one sample. If fertilizer has been banded, a larger number of samples will be necessary, and results may be less reliable. The test will not detect residual ammonium-N from fertilizer, so may underestimate the amount of fertilizer N remaining. If the PSNT finds 25 ppm or more nitrate-N in the top foot of soil, no additional fertilizer is needed. If the PSNT is 16-25 ppm, apply an additional 30 lb N/acre, if 11-15 ppm, apply an additional 60 lb N/acre, and if less than 11 ppm, apply an additional 90 lb N/acre.

Carefully monitoring the crop for N status is another option, primarily between now and silking, especially if producers have the option to sidedress, fertigate or apply N with high clearance equipment. Most corn hybrids will take up the majority of their N in this period. Visual observation for signs of N deficiency (lower leaves yellowing, inverted V yellowing pattern of leaf tips) is one option, although yield potential may be reduced by the time N deficiency is visually evident. A chlorophyll meter may be useful in detecting N stress before it can be seen. To calibrate chlorophyll meter readings, it is best to have one or more strips in the field with N applied at a rate high enough to be non- yield limiting to serve as a reference. For more information on the use of a chlorophyll meter to manage N, see http://www.ianrpubs.unl.edu/sendIt/g1632.pdf

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Hoary Vervain Control in Pasture

Hoary vervain *(Verbena stricta),* also known as wooly verbena or tall vervain, is a commonly found native weed in northeastern Nebraska on over-grazed rangeland, prairies and disturbed sites in all soil types. There are several other types of vervain in Nebraska (prostrate, white, and blue), of which most have similar growth forms and habits as hoary vervain. Hoary vervain is a perennial

forb from the vervain family (Verbenaceae) that reproduces by seeds. The taproot (perennial structure) produces individual erect plants. The stem is nearly round, simple or branched above and can be up to 5 ft tall, covered with soft white hairs. Leaves are opposite, leaf blades are ovate with many teeth. Lower leaf surfaces are pubescent with highly visible veins. Like many other plant species, the overall growth and development depends on the amount and timing of rainfall. Hoary vervain, in Nebraska, can flower from May to September, with blue or purple flowers positioned on the top of the main stem and branches and producing a two seeded fruit.

Hoary vervain provides forage for deer while seeds are important food source for small mammals and upland birds. Native Americans also made a tea from the leaves to treat stomachache. Hoary vervain has no value to livestock because of its low palatability.

This weed can be controlled by various means. Mowing the plants when they are 3-5 inches tall can reduce vervain population considerably for the season. Mowing can be done one or two times per season depending on the amount of rainfall during the season. One mowing done in mid June can be effective (>75% control) if the season is dry, due to lack of moisture needed for weed regrowth. If the season is wet, an additional mowing is needed in July-August. Herbicides can be also very effective in providing a season long control. Herbicide application should be conducted when vervain plants are 3-5 inches tall, which is usually in early part of June. The list of effective herbicides, their rates and cost per acre includes: Salvo (12 oz/acre, $4), Grazon P+D (32 oz/acre, $8), Weedmaster (32 oz/acre, $6), Ally (0.25 oz/acre, $8), and Vista (22 oz/acre, $8). (SK)

Comparison of Glyphosate-Based Herbicides in Nebraska

The proliferation of glyphosate-based products into the glyphosate-resistant crop market is unprecedented. Currently, there are more than 40 glyphosate-based herbicides registered for use in Nebraska. The influx of the generic glyphosate-based herbicides has also resulted in price reduction as distributors attempt to remain competitive. Producers are interested in getting the best weed control for the lowest cost creating an interest in the efficacy of these products. Therefore, we compared efficacy of a variety of glyphosate-based products (generic and brand names) on weed control over 3 years at 6 locations in Nebraska. Weed species composition in our studies included: velvetleaf, common waterhemp, sunflower, kochia, Russian thistle, lambsquarters, and a mix of foxtail species. Depending on the year or location, we tested these glyphosate-based products at two rates (label rate and half-rate): Roundup Ultra, Roundup UltraDRY, Roundup UltraMAX, Roundup WeatherMAX, Touchdown w/IQ, Cornerstone, Clearout 41 Plus, GlyphoMAX, Glyfos Xtra, and Glyphomax Plus.

All herbicides provided excellent weed control (> 90%) regardless of the rate or brand name. For example, there was no significant difference in the level of weed control for a brand name Roundup Ultra Dry when compared to a generic product such as Clearout 41 Plus. In another example, the level of weed control was not significantly different for a brand name product such as Roundup WeatherMax when compared to the generic product such as Clearout 41 Plus, or any other herbicide tested.

These findings were similar to the results reported by our colleagues from other states. Therefore, generic glyphosate-based products can provide a valuable tool for weed control in glyphosate-

tolerant crops, especially to those producers who are interested in lowering crop production inputs by reducing the weed control costs. Perhaps more important decisions by producers should be selecting the appropriate rate for the weeds present, observing environmental factors, and herbicide costs, rather than choosing a glyphosate trade name.

In addition, with the growing popularity of the relatively inexpensive generic glyphosate- based products there is an even grater need for their proper use. Their value can be preserved only by proper management, and reduced overuse. This becomes even more important when other Roundup-Ready crops become more readily available (e.g. Roundup-Ready corn and Roundup-Ready alfalfa). It is easy to fall into a trap of overusing glyphosate when one glyphosate-resistant crop is grown after another. Therefore, proper use of glyphosate-based technology, as a component of integrated weed management program, is the key to preserving the long-term benefits of this technology while avoiding many of the concerns about their use, or misuse. For more details about proper use of herbicide-tolerant crops see our NebGuide-G02-1484-A) titled: *Use of herbicide tolerant crops as a component of an integrated weed management program.* (SK)

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