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Maximizing Forage/Beef Yields In Wheat/Stocker Production Systems

Studies in Texas plains examine optimal N fertility levels in both no-till and conventional-till production systems.

SUMMARY

There was no significant difference in forage production systems indicating that no-till in dual-use wheat was as effective in producing forage as conventional-till during the 2003-2004, 2004-2005 and 2005-2006 seasons. However, there was a significant effect of increasing amounts of preplant nitrogen (N) on forage production in the early part of the growing season in 2003-2004 and 2004-2005 but not in the poor-growth season of 2005-2006. Data showed that not all N is lost from one season to the next when a crop does not fully use applied N. Topdressing increased forage protein content regardless of the amount of preplant N, up to 120 lbs/A. In 2004 and 2005, there was a general increase in grain protein with increased preplant N application.

The Texas Rolling Plains has very large and diverse wheat/stocker operations that rural economies depend on as a major source of revenue. In these systems, wheat is planted in September under conventional-till. Conventional-till results in the loss of soil moisture, reduced organic matter, soil compaction, and soil organic carbon loss. Numerous field operations with large, expensive equipment along with high operating and labor costs are required to prepare "clean" fields prior to seeding. Soil erosion by wind and water can be extensive on exposed soil. Wheat seedlings are unprotected from desiccating wind and washing out under conventional-till. Large areas are subject to replanting, creating costly delays in wheat establishment and plant growth needed in a graze and grain wheat/stocker operation.

Conservation-till holds promise in mitigating soil and moisture losses in wheat/stocker systems. Cover crops and/or crop residue on the soil surface enhance rainfall capture and retention, reduce evaporation, maintain seedling viability longer than under conventional-till, provide weed suppression, and increase profitability. However, producers in the Rolling Plains have not adopted no-till in a grazing system because of reservations about stand establishment, soil compaction, soil fertility, lack of proper equipment, and weed control. Understandably, most do not want to risk their future on an unproven technology. However, a few producers have successfully implemented no-till management in grain-only systems.

A major enterprise is stocker cattle on wheat pasture, with 30 to 80 percent of the wheat grazed each year. A key input to all wheat production is nitrogen (N) fertilizer. Information on N fertility response of wheat in a no-till grazing system does not exist, although this knowledge is vital to successful implementation of no-till grazing

systems. Priority research has been placed on no-till and reduced-till systems in a dual-purpose wheat/stocker enterprise, particularly development of efficient N and phosphorus (P) fertility programs.

Our current research has shown that stand establishment in no-till systems can be successful with the proper equipment. Furthermore, soil compaction may not be as serious as previously believed, as long as a reasonable amount of residue is maintained on the soil surface to cushion hoof action and the impacting effect of rain. It may take several years for a new production system to stabilize, particularly when converting from conventional-till to a conservation tillage system.

The major source of death loss and depressed stocker cattle performance on wheat pasture is bloat. Recently we have shown a relationship between bloat and soluble proteins in wheat forage, and how N fertilization affects soluble protein in wheat forage. Manipulating and managing the amount and/or timing of N application may reduce the incidence of bloat and enhance returns in wheat/stocker operations.

Objective of this study was to identify N fertility levels that maximize forage and beef yields as well as maintaining grain yield and quality in no-till and conventional-till production systems. The severe drought in 2005 and 2006 devastated dryland wheat production and crucial information on wheat grain yields in dual-purpose wheat was lost.

Drought effects

The 2005 to 2006 winter wheat growing season was extremely poor, with a major drought from October 2005 through August 2006. Soil moisture profiles to 5 feet indicated increasingly dry conditions as the season progressed. By the end of February, little soil moisture was available to carry the plants to an economical grain yield. No statistical analyses were conducted in 2006.

Forage production

Figure 1 shows forage production in conventional-till and no-till plots from early December through early March of 2003-2004, 2004-2005, and 2005-2006 across all N preplant applications and by N preplant applications across both tillage systems. There was no significant difference in forage production between tillage systems, indicating that no-till in dual-use wheat production was as effective in producing forage as conventional-till. However, there was a significant effect of increasing amounts of preplant N on forage production in the early part of the growing season in 2003-

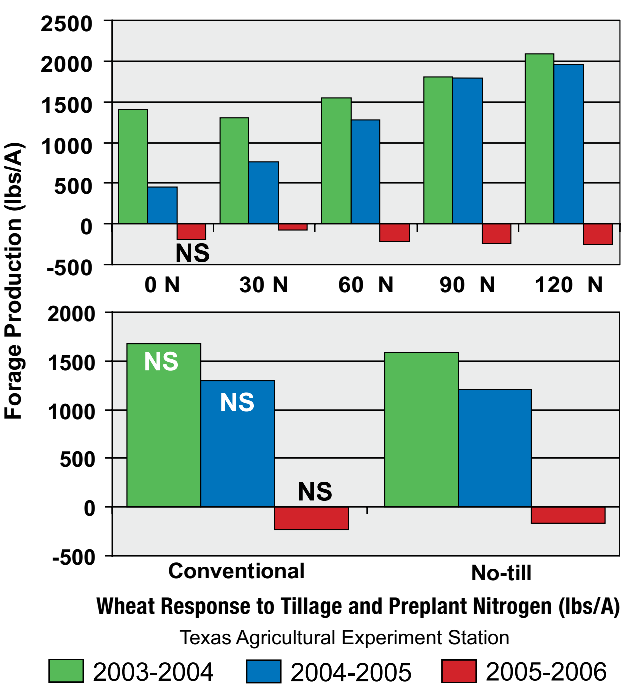

Figure 1. Forage production from early December to early March in two tillage systems and five preplant N applications. NS = no significant difference

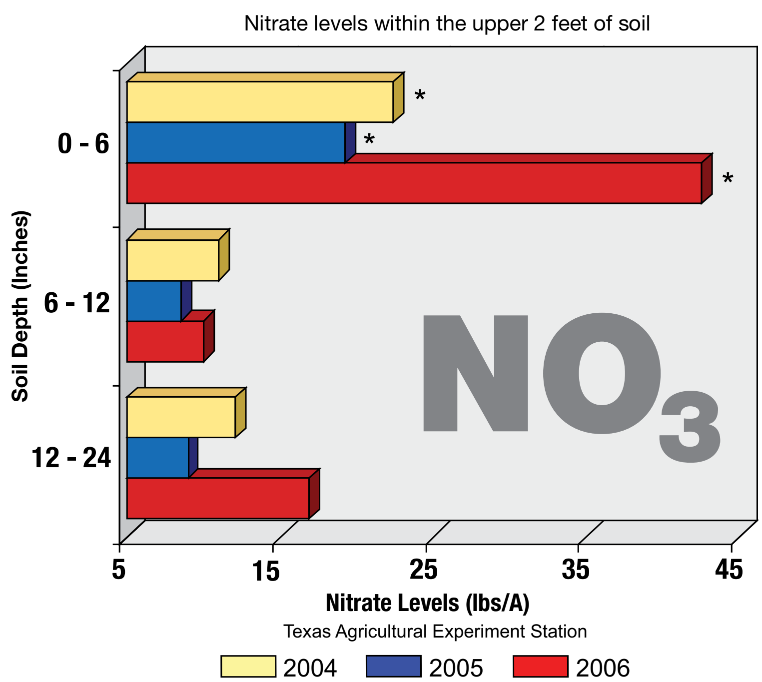

Figure 2. Soil nitrate levels from early December to early March, averaged across two tillage systems and five preplant N applications. * = significantly higher.

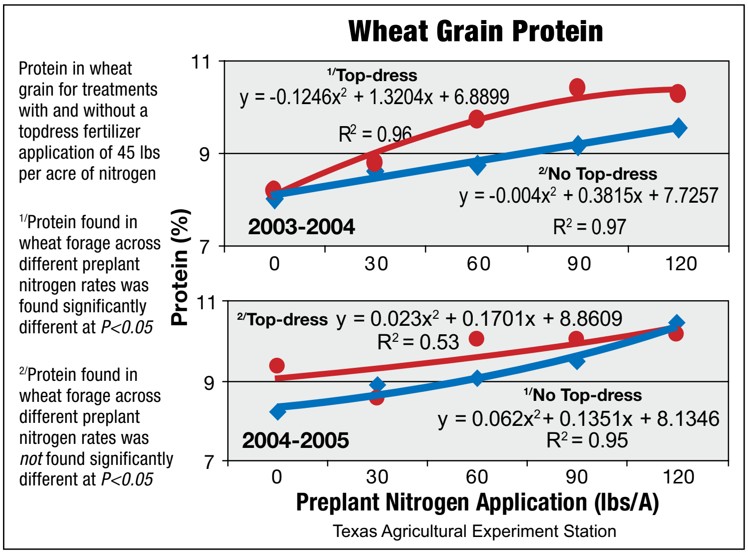

Figure 3. Protein in wheat grain treatments with and without a topdress fertilizer application of 45 lbs/A of N.

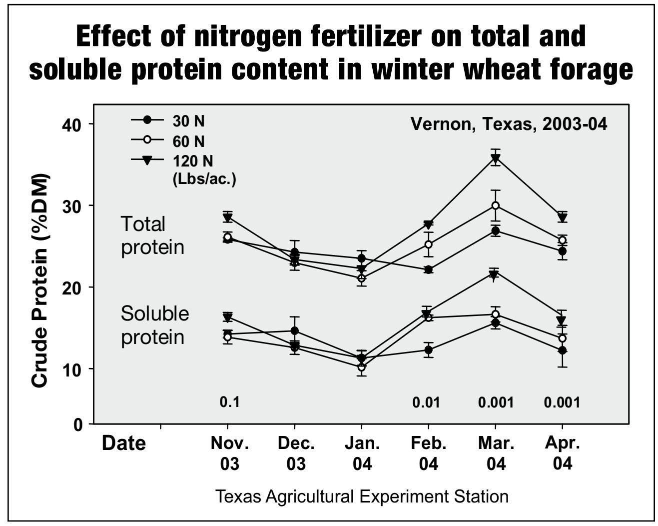

Figure 4. Time-course of N effect on total and soluble plant protein in winter wheat fertilized with 3 preplant N rates (data provided by Dr. W. E. Pinchak, TAES, Vernon).

2004 and 2004-2005 but not in the poor growth season of 2005-2006.

Nitrate levels

Figure 2 shows soil nitrate levels at three depths averaged across two tillage systems from 2004 through 2006. Differences in nitrate content by depth were significant each year with the 0- to 6-inch depth containing the highest nitrate levels, as expected. In 2006, nitrate content in the upper 6 inches of soil was considerably higher than in the previous two years, reflecting poor use of N due to crop failure. These data point to the fact that not all N is lost from one season to the next when a crop does not fully use applied N. Under these circumstances, producers should not rely on past fertilization experiences but should soil sample to determine the levels of residual N and perhaps save on fertilizer costs for the subsequent crop.

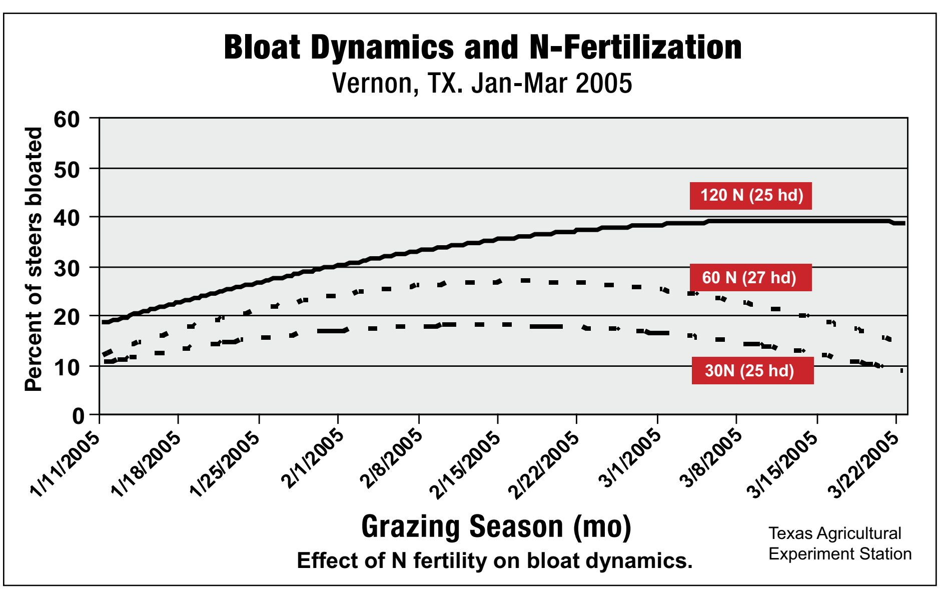

Figure 5. Time-course of bloat development as influenced by 3 preplant N fertility rates (data provided by Dr. W. E. Pinchak, TAES, Vernon).

Topdressing

In 2004 and 2005, there was a general increase in grain protein with increased preplant N application. Topdressing N generally resulted in an additional increase in grain protein but, surprisingly, not over about 1 percent (Figure 3). Unfortunately, grain protein even at the highest levels was not considered sufficient to measurably enhance baking quality. Only one wheat variety was used in the study but early results indicate that in a dual-use system in this region it may not be possible to significantly increase grain protein with high N applications.

Bloat

Figures 4 and 5 show the time-course correlation between protein increase with three preplant N application rates and the degree of bloat in stocker cattle over the same period. Farmers and ranchers need to be aware of this relationship.

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