COTTON PROGRAM

Cotton Uptake of Nitrate from Different Soil Depths

Overview
Cotton is the major agronomic cash crop in Texas, with 5 to 6 million upland acres harvested annually. Nitrogen is the most common fertilizer input into most cotton management systems. Proper management is critical for achieving optimum yield, decreasing susceptibility to insects/disease, and increasing profitability, especially with the escalating cost of fertilizer. Research sponsored by the Texas State Support Committee and Cotton Inc. showed widespread incidence of high residual nitrate concentrations in soil profiles in all Texas cotton production regions. This research showed that at least a portion of the nitrate should be subtracted from fertilizer recommendations to achieve a given yield goal, thereby reducing nitrogen fertilizer application rates. Questions remained, however, as to what this portion is, its constancy with depth, and to what depth should residual soil nitrate be considered in fertilizer recommendations?

Until this project, Texas AgriLife Extension recommended sampling soil to a depth of only 6 inches. Residual nitrate below this depth that may be available to cotton was ignored, resulting in higher fertilizer nitrogen recommendations and possibly contributing to excess profile nitrate.

Research Objectives
- Determine the uptake of nitrate by cotton from different soil depths
- Determine when nitrate uptake from various depths occurs during the growing season
- Modify Texas AgriLife Extension’s soil sampling and fertilizer nitrogen recommendations for cotton

Procedure
A tractor-mounted hydraulic soil sampler pushed a soil tube to the appropriate depth. 15N-labeled calcium nitrate solution was put into each core hole via syringe and attached tubing, followed by water. After adding fertilizer, holes were backfilled with ground soil and tamped (to help prevent irrigation and rainfall from flowing into the holes and moving the added nitrate to deeper depths).

Research and Results
Cotton was able to access the added nitrogen fertilizer equally well by the first seasonal plant sampling in surface to 18-inch placements. For 30- and especially 42-inch placements, uptake was greater by the second compared to first sampling. Results supported soil sampling to at least an 18-inch depth for residual soil nitrate for cotton. Texas AgriLife Extension has adopted this recommendation, potentially saving cotton producers at least $50 million annually in reduced fertilization costs.

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