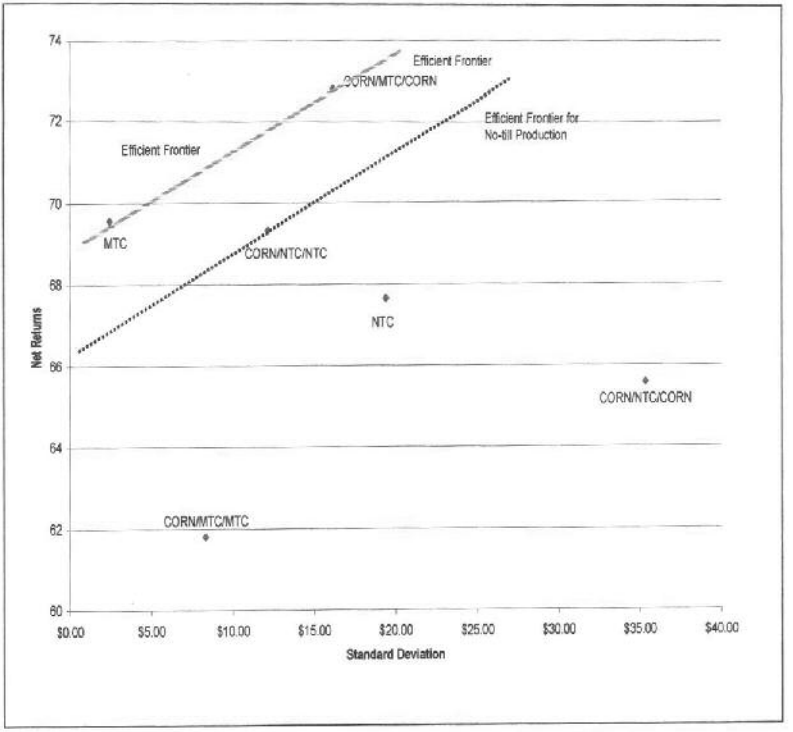
Figure 1. Mean Net Returns and Standard Deviation Comparison from 2001-2006, Stoneville, MS.



Accumulation Of Nitrates In Soil Profiles Due To Over-Fertilized With Urea In Optimum Irrigated And Dry Land Cotton Production Systems

Presented by Dr. J. Scott McConnell

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Nitrogen (N) fertilizer use in cotton (Gossypium hirsutum L.) production has come under scrutiny as a potential source of nitrate contamination of streams and ground water. This study was conducted to determine the distribution of nitrate-N in soil cropped to continuous cotton, and to evaluate fertilization practices and irrigation methods that might exacerbate the accumulation of nitrate--N in the soil profile.

Long-term N-fertilization studies in side-by-side irrigation blocks at the Southeast Branch Experiment Station at Rohwer, Arkansas, the McConnell - Mitchell Plots, were utilized to determine nitrate-N accumulation and depletion. The soil at the study site was an Hebert silt loam (fine-silty, mixed, thermic Aeric Ochraqualfs). This test, the oldest continuous test in Arkansas, was established in 1982. The two irrigation methods reported are furrow flow irrigation (FI) and high-frequency center pivot (HFCP). The two irri-

gation methods were compared to a dry land (DL) control. Nitrogen treatments were tested within each irrigation block and ranged from 0 to 150 lb N/acre in 30-lb N/acre increments. Nitrogen treatments were first applied in 1982 and continued through1999. Nitrogen treatments were discontinued from 2000 through 2003, then resumed in 2004. Soil samples were taken in the early spring (2000 and 2004) prior to N-fertilization to a depth of 5.0 ft in 0.5-in increments from three replicates of each N-treatment within each irrigation block. The samples were air-dried, ground, and analyzed for nitrate-N.

The distribution of soil nitrate-N in the FI block indicated significant differences due to sample depth and N treatment in both 2000 and 2004. Soil nitrate-N was lowest in the surface 1.0 ft, and greatest soil nitrate-N was found from 1.5 to 2.5 ft, although not all differences were significant in 2000. Differences in soil nitrate-N in the FI block after suspending N treatments for four years were similar to those found in 2000, although the soil nitrate-N was generally depleted in 2004 compared to 2000. The primary zone of nitrate-N accumulation was within the argillic horizon both years. Soil nitrate-N was found to increase irregularly with increasing N rates both years.

The distribution of soil nitrate-N in the DL block was dependent on the interaction of sample depth with N treatment in 2000 and 2004. Soil nitrate-N was minimal in the three lowest N treatments (0-, 30-, and 60-lb N/acre) in 2000. The 90 lb N/acre treatment had substantial accumulations of soil nitrate-N in the surface 2.0 ft that declined with depth in 2000. Greatest amounts of soil nitrate-N were found in conjunction with the 120- and 150-lb N/acre treatments at depths of 0.5 to 2.5 ft in 2000. These depths extend approximately midway through the argillic horizon. Soil nitrate-N was minimal in the four lowest N treatments (0-, 30-, 60-, and 90-lb N/acre) in 2004. This indicates that discontinuing the N treatments for four years, in combination with continuous cropping depleted the soil of some of the excess nitrate-N. The upper 2.0 ft of 120- and 150 lb N/acre treatments were also found to be depleted of excess soil nitrate-N in 2004. Observationally, this depth coincides with the approximate depth of rooting of the cotton crop most years.

The distribution of soil nitrate-N in the HFCP irrigated block was dependent on the interaction of sample depth with N treatment in 2000 and 2004. No significant difference was observed in the soil nitrate-N of the 0- to 120-lb N/acre treatments in 2000. The 150 lb N/acre treatment produced soil nitrate-N concentrations that significantly differed with both other depths within the treatment and with other N treatments in 2000. Differences in soil nitrate-N were too small to be of practical importance in 2004. Differences in soil nitrate-N between the two sampling years were evident only in the 150 lb N/acre treatment, and indicate that the nitrate-N was depleted from the soil.

These results indicate that accumulation of nitrate-N in soils cropped to cotton was a potential environmental problem only in the DL block when N treatments exceeded crop requirements. Further, reserving N fertilization for more than four years may be required to deplete excess soil nitrate-N.

▸ Where Do Seed Treatments Fit In Cotton Disease Management?

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In the past, in-furrow applied fungicides and nematicides were the most effective method for managing cotton seedling diseases and nematodes. However, with the advent of new seed treatment fungicides and nematicides, producers now have the option of using a complete package on the seed for their seedling disease and nematode problems. This option is attractive to producers because of the added convenience, but questions remain about the effectiveness of these treatments relative to the in-furrow applied products.