Using the Late Spring Test

Paul and Karen Mugge, Sutherland, looked at the value for corn of liquid hog manure compared to purchased nitrogen. In the spring following soybeans, they knifed 2,500 gallons into alternate row middles, avoiding wheel tracks. Paul estimates that application to have been 100 pounds worth of total nitrogen. In the comparison treatment, they relied on the late spring test for a rate to sidedress 28-percent N.

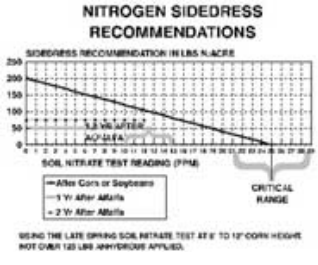
Ray Stonecypher discussing nitrate application and ridge till at a PFI field day.

When Paul took the late spring soil nitrate test on June 7, results indicated only 14 ppm (parts per million) nitrate where liquid manure was applied. That didn't seem to make sense. ISU agronomist Fred Blackmer suggested that, since the test would still be valid until the corn reached one foot in height, Paul should sample again in a few days. On June 19, the test showed adequate nitrogen for the crop.

Leaf samples Paul took mid-season also indicated no shortage of N in either the manure or the purchased N treatment. The corn receiving liquid manure yielded somewhat less on average, but not enough so that random chance could be discounted. But Paul also took end-of-season stalk samples for nitrate analysis, and these suggest that the manured corn, in fact, ran out of N. The target range for stalks is 700-2,000 ppm nitrate. The corn that received only purchased N averaged 1,300 ppm, while the manured corn showed only about 120 ppm! Maybe the first results from the late spring test were the right results!

Another possibility suggested by Blackmer relates to incorporating manure in concentrated bands. With the concentrated carbon source, it is possible for the subsurface band to become anaerobic to the extent that significant denitrification takes place. While Blackmer emphasizes we don't yet know the precise conditions in which this would occur, he points out that it would be a case of more manure amounting to less crop-available N.

Figure 3. Nitrogen sidedress recommendations (LBS N/Acre) for the late spring soil nitrate test for corn.
Using the late spring soil nitrate test at 6" to 12" corn height. Not over 125lbs Anhydrus applied.



Ray and Marj Stonecypher, Floyd, also used the late spring soil nitrate test in their comparison of two sidedress N rates (Table 1). And like Paul Mugge, Ray Stonecypher took the late spring test twice. On June 19 the test yielded 14-15 ppm nitrate. A more thorough sampling on June 21 gave 11 ppm. In some years past, Ray has undercut the recommendations from the test without a loss in corn yield. Most of those fields, however, have a history of some manure. This particular field has no manure history, and that may be reason to use the late spring test more conservatively. According to ISU agronomist Alfred Blackmer, guidelines for using the late spring test with manured soils should be released next spring, and they will call for less nitrogen.

The ISU Extension bulletin Soil Testing to Optimize Nitrogen Management for Corn (Pm-1521) suggests setting a critical level of 25 ppm and sidedressing 8 pounds of N for every ppm below that in the sample (Figure 3). Using Ray's example: (25 - 11) × 8 = 112 lbs N. Ray's low sidedress rate, 60 pounds N per acre, would be below the guidelines even if a critical level of only 21 ppm were used. The high rate treatment, 120 pounds N sidedressed, was "in the ball park."

Like the Mugges, Ray and Marj discovered low levels of nitrate in the corn stalk at the end of the season. The high rate treatment averaged about 450 ppm, and the low rate treatment averaged about 170 ppm. While results below the 700-2,000 target range do not definitely mean the crop was short of N, the numbers show that none of the corn had excess nitrogen left at the end of the season. This is especially true for the corn that received the 60 pound sidedress. It yielded significantly less than the corn that received 120 pounds.

The 120-pound N corn, with a stalk nitrate of 450 ppm, is in the "marginal zone," as described by soil scientist Blackmer. Between 250 and 700 ppm, "producers should not be concerned," says Blackmer,

but they should set their target for 700-2,000 ppm. The 10.6 bushel difference shows that in this particular trial there was a strong response to N between the 60 and 120 pound N rates.