2-26-2001

Nitrate testing: early versus late spring

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Nitrate testing: early versus late spring

Abstract
Can I test my fields for nitrate in early spring, before preplant applications of nitrogen (N)? Many producers who do not want to sidedress their N are asking this question. The question is common because some states recommend testing soils for nitrate at this time. Such recommendations make sense where the amounts of nitrate carried over from one season to the next vary greatly. Great variability in this "residual nitrate" should be expected in fields treated with high rates of fertilizer N for the previous crop. The value of such testing is questionable, however, for corn grown after soybean or alfalfa in Iowa.

Keywords
Agronomy

Disciplines
Agricultural Science | Agriculture | Agronomy and Crop Sciences

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The question is common because some states recommend testing soils for nitrate at this time. Such recommendations make sense where the amounts of nitrate carried over from one season to the next vary greatly. Great variability in this "residual nitrate" should be expected in fields treated with high rates of fertilizer N for the previous crop. The value of such testing is questionable, however, for corn grown after soybean or alfalfa in Iowa.

Soil testing for residual nitrate in the fall or early spring is often recommended in regions that receive less rainfall than Iowa. Testing for this nitrate requires sampling deeper than 1 foot. Because Iowa subsoils tend to be saturated with water in early spring, three noteworthy problems may occur. First, relatively fine-textured soils, which dominate the Iowa landscape, are extremely difficult to sample when saturated. Second, nitrate tends to escape from saturated soils as samples are collected and handled. Third, nitrate found in saturated soils in April is likely to be lost from the rooting zone before rapid growth of plants begins in June.

Broadcasting UAN solutions immediately after planting is commonly practiced in Iowa.

Estimates of N fertilizer needs calculated from preplant nitrate tests usually are based on yield expectations. The notion that N fertilizer needs should be proportional to yield expectations seems reasonable and has been widely accepted. However, research over more than a decade consistently has shown that this proportionality usually does not hold under the conditions found in Iowa.

Recommendations to use the late-spring test for soil nitrate in Iowa were initially based on observations that carryover of N as nitrate was less important than generally believed and that losses of fertilizer N soon after application were more important than generally believed. Experimental data collected during the past decade continue to support these observations.
Recent articles in this newsletter have summarized some of this evidence.

Additional evidence was collected in an on-farm study. The farmer applied recommended amounts of N by broadcasting a urea-ammonium-nitrate solution immediately after planting. The late-spring test indicated that little of this N remained in the soil on June 1. Large responses to fertilizer N sidedressed in strips confirmed that large losses of fertilizer N had occurred. They also indicated that the producer had suffered substantial yield loss in portions of the field that did not receive extra N as a sidedressing.

Aerial photograph of a cornfield in August. Relatively dark green strips show that sidedressed N corrected deficiencies caused by loss of the farmer's N.

The late-spring test for soil nitrate was developed for Iowa corn producers who do not want to rely on sidedressing. This seemed necessary because relatively few corn producers in Iowa sidedress their N. Accordingly, all research supporting the present Iowa guidelines was conducted on fields where fertilizer N or animal manures had been applied before crops were planted. Research for use of this test on nonfertilized cornfields is being done in Iowa, but the results will not alter recommendations for producers who do not want to rely on sidedressing for all or part of their N.

The notion that the late spring test was developed only for producers who rely on sidedressing has been extremely difficult to dispel. Part of the problem is that the test is often called a "pre-sidedress N test," a term that originated outside Iowa. Part of the problem is that producers are accustomed to receiving recommendations that focus on rate of N application and essentially ignore the great importance of time and method of N fertilization.

Early spring tests for nitrate are appealing because they represent minimal departure from recommendations most commonly given in the past. Soil testing in late spring, however, enables individual producers to objectively evaluate their N management practices on their fields. Such soil testing requires a greater change in thinking, but it is much more likely to help producers improve management of N on their farms.

This article originally appeared on pages 13-14 of the IC-486 (2) -- February 26, 2001 issue.

Source URL: