

5. Once the sample has dried, place in the plastic bag included in the soil testing packet. Complete the enclosed questionnaire with particular attention to the areas concerning contact phone number, recommended time to call, yield goal and irrigation use.

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SOIL TEST NOTES

6. Return the sample as soon as possible to the University of Delaware Soil Testing Laboratory or the nearest Cooperative Extension office.

7. You will receive a phone call with results and the appropriate N recommendation within 2 days of the sample's arrival at the laboratory. A report form with the PSNT results and N fertilizer recommendation will also be mailed to you at that time.

**NOTE:
PROPER SAMPLE PREPARATION IS CRUCIAL TO THE ACCURACY OF THIS TEST. SOIL SAMPLES MUST BE DRIED. ANY MOIST SAMPLES RECEIVED WILL NOT BE PROCESSED AND THE TEST FEE WILL BE RETURNED TO YOU.**

ADDITIONAL INFORMATION

Additional information may be obtained from University of Delaware Cooperative Extension offices in Newark, Dover, and Georgetown.

NOTE 14: Pre-Sidedress Soil Nitrate Test For Corn

Efficient nitrogen (N) fertilization practices for corn are based on two related principles: (1) attainment of maximum economic yields, and (2) minimization of environmental problems caused by excessive soil N. The University of Delaware Soil Testing Program offers the Pre-sidedress Soil Nitrate Test (PSNT) that will help corn producers achieve these goals.

The N requirement of corn, unlike many other nutrients, such as potassium or phosphorus, cannot normally be met by N found in the soil. Consequently, most of the N needed by corn is supplied by applications of commercial fertilizers or manures. One exception to this rule can be found with crop rotations that include legumes such as alfalfa, clover, or hairy vetch, where N available from legume residues can often provide most or all of the corn N requirement.

Until recently, soil tests for N could not reliably identify the amount of N available to corn from soil organic matter, animal manures, crop residues, or previous applications of N fertilizers. The unpredictable effects of temperature and rainfall on the release of N from organic sources, the retention of N from previous fertilization in the rooting zone, and crop yield and N requirement made prediction of N fertilization in advance of planting extremely difficult. Fertilizer recommendations were, as a result, made strictly on the basis of expected crop yield. Generally, a factor of 1.0-1.2 pounds of N fertilizer

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per bushel of corn was used to determine the N rate recommended.

Increasing concerns about nitrate (NO_3) leaching to groundwater have resulted in intensified research efforts to develop soil tests that can help growers identify economically and environmentally sound N rates for corn. The "pre-sidedress soil nitrate test" (PSNT) is one of the most promising advances in soil N testing in many years. Proper use of this test can result in economic savings and reduce the likelihood of groundwater contamination by nitrate-nitrogen. This note describes the basis for the test, and the sampling and handling procedures required by the University of Delaware Soil Testing Program.

The Pre-sidedress Soil Nitrate Test

The PSNT was developed in Vermont and has since been tested and used commercially in many eastern and midwestern states. The PSNT is based on the concept that the soil nitrate-N level early in the growing season is proportional to the amount of N that will be available from the soil and organic N sources recently added to the soil (e.g. manures, legume residues). The remainder of the crop N requirement will then be supplied by side-dressing N or through fertigation of N. A soil sample is taken immediately before the period of maximum N uptake by corn (Fig. 1), when plants are about 10-12" high.

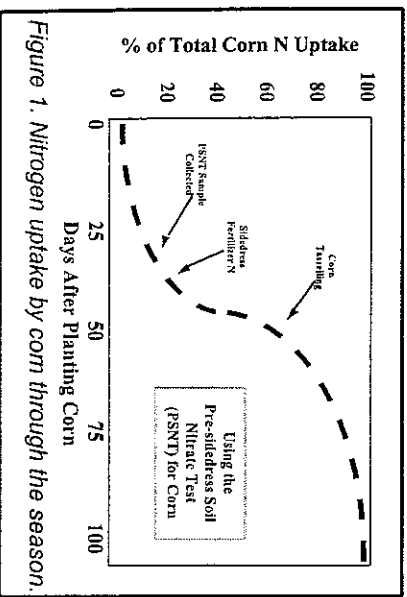


Figure 1. Nitrogen uptake by corn through the season.

A N recommendation is then made, based on the soil nitrate-N concentration in this sample and other management factors such as yield goal, plant stand, pest or weed pressure and irrigation use. In many recent studies the PSNT has successfully identified situations when available soil N was totally adequate for the crop, and no additional N fertilization was required -- a considerable economic savings to the farmer. If N fertilization is needed the PSNT can aid in identification of an appropriate N rate.

The PSNT has been evaluated in field studies conducted in a number of Mid-Atlantic states including Delaware (Fig. 2) and has shown good results, particularly on fields with a history of manure use. Relative yields on test sites, defined as the ratio of yield with no added N to optimum yield on the site where N was added, were well correlated to soil nitrate levels. Calibration studies conducted to develop relationships between soil nitrate levels and yield following sidedress applications of N determined that at a soil nitrate concentration of 20 ppm or more, little yield increase resulted from the addition of sidedressed N.

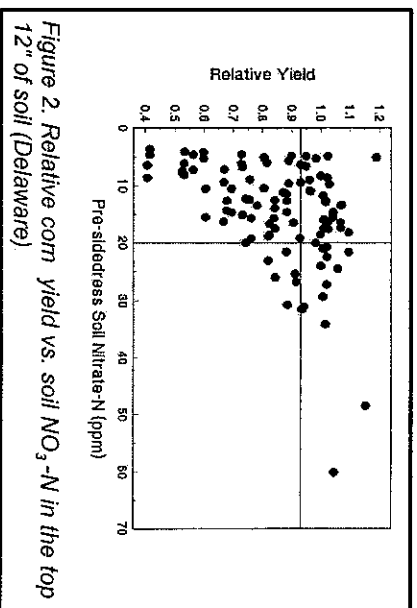


Figure 2. Relative corn yield vs. soil $\text{NO}_3\text{-N}$ in the top 12" of soil (Delaware)

The PSNT is quick and easy to perform and can be conducted by farmers, Cooperative Extension agents, crop consultants or through the UD Soil Testing Laboratory. Proper sample collection and preparation, however, are absolutely essential for successful use of the PSNT.

Sample Collection and Preparation

Unlike a routine soil test in which the levels of individual nutrients evaluated vary little between the time of sampling and the time of analysis, the PSNT evaluates nitrate-N, a form of soil N highly susceptible to changes due to fluctuating soil temperature and moisture conditions. For this reason, sample preparation is very different from that used with routine soil samples. It is extremely important that the following steps (especially those related to sample drying) be completed if accurate results and an appropriate N recommendation are to be obtained.

1. The PSNT is available through either the University of Delaware Soil Testing Laboratory or county Cooperative Extension offices. In either case, a cost of \$6.00 per sample will be assessed. **Since time is limited between sample collection and N application, growers will receive both a phone call and a printed report with results and recommendations for this sample fee.**
2. Obtain a soil sample bag labeled "Soil Nitrate Test" from your nearest Cooperative Extension office. A separate sample bag is needed for each field to be tested.
3. Take 15 to 20 soil cores to a depth of 12" from the field to be tested when the corn plants are 10-12" tall. Take cores from the middle of the row to avoid any fertilizer bands laid down at planting.
4. Combine the soil cores and mix thoroughly. Spread a 1-2 cup subsample of the soil very thinly (1/2" or less) on newspaper in a warm place and allow to dry. This step is very important as it minimizes any changes in the soil nitrate level prior to analysis. **If you are unable to dry the sample within 1 hour of collection, place the sample on ice or in a refrigerator until the sample can be dried properly.**