

Nitrogen Recommendations for Corn Using the Presidedress Soil Nitrogen Test

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INTRODUCTION

A presidedress soil nitrogen test (PSNT) has recently been developed for corn growers in the Northeast States. Because of the complex behavior of nitrogen (N) in soil, it has always been difficult to estimate the amount of N that will be available from nonfertilizer sources - manure, crop residues, and soil organic matter at time of corn planting. Growers sometimes overapply N because they perceive the need for "insurance" and do not give sufficient credit to these onfarm nitrogen sources. The PSNT measures the nitrate concentration in soil in June when the soil is warm and has begun to release available N for the growing season. This test removes much of the guesswork involved in making sidedress nitrogen fertilizer recommendations and should be especially useful to growers who use manure or have legumes in rotation with corn. In many cases, recommendations based on this test will result in applying less N fertilizer without affecting yield. This means reduced cost for fertilizer and less possibility for nitrate contamination of water supplies.

BEST MANAGEMENT PRACTICES AND PSNT

The PSNT works with other best management practices to improve corn N fertility management.

1. Apply N only as a starter (at 15 to 20 lbs. N/acre) at time of corn planting. If additional N is needed (based on the results of the PSNT) then sidedress N is applied just prior to the time of corn's period of maximum N uptake. Sidedressing reduces losses of N due to leaching and denitrification.
2. The amount of N to sidedress depends on soil N availability as determined using the PSNT. The

N recommendation, however, must be based on a realistic crop yield goal.

3. The PSNT makes adjustments for the amount of N released and supplied by soil organic matter, animal manures, and previous legume crops. The PSNT also measures and adjusts for carryover N from previous N fertilizer applications. Because the PSNT provides site-specific recommendations, areas having different soil types or management histories must be sampled separately.

RELIABILITY OF THE PSNT

The PSNT was developed based on research conducted in Vermont, Pennsylvania, and Iowa during the 1980s. To evaluate the PSNT for New Jersey conditions, studies were conducted at five onfarm locations in 1990. The locations represent a range of soils (coarse- and fine-textured soils) and field histories (previous legume crop or manure amended and unamended soils). At each study location, three treatments were compared:

1. a control with no sidedress N applied.
2. a sidedress N application based on the PSNT recommendation.
3. a heavier application of sidedress N to determine the maximum yield at that site and to test for the sufficiency of the PSNT recommendation.

The yield goal at each location was 150 Bu/Acre. The amount of sidedress N recommended for this yield goal, based on the PSNT, ranged from 75 to 125 lbs. N/Acre. Results showed that applications of N greater than the PSNT recommendation did not result in further increases in yield. Even though the yields obtained (160-200 Bu/Acre) at each location were greater than the yield goal, the PSNT recommenda-

tion was shown to be sufficient. The 1990 field trials suggest that the PSNT provides reliable sidedress N recommendations. The results also demonstrate that use of the PSNT can reduce N fertilizer applications without a loss in yield.

PROCEDURES FOR PRESIDEDRESS SOIL NITROGEN TEST

1. Obtain a soil probe that can sample to a 12 inch depth and a soil nitrate test kit. An agricultural agent in the Rutgers Cooperative Extension office in your county can provide you with equipment sources.
2. Sample soil when corn plants are 6 to 12 inches tall or about 1 week before sidedressing is planned.
3. Sample soil to a 12-inch depth. Collect about 20 cores at random in the test area. Areas having different soil types or management histories must be sampled and treated separately.

4. Crumble the cores and thoroughly mix the soil before a subsample is removed for analysis.
5. Because microbial activity can rapidly change the concentration of nitrate in the soil samples, start to dry samples immediately. The samples can be dried by spreading the soil in a thin layer on newspaper overnight or by placing on a cookie sheet and heating in an oven at 200-250°F until dry. Also, samples can be dried rapidly in a microwave oven by spreading a cupful of soil thinly on a disk and microwaving at full power for 5 to 8 minutes, depending on the moisture content of the soil. Once dried, crush the soil to a fine particle size and remove any stones. Sift the sample through a 10- mesh sieve.
6. Use one of the commercially available soil nitrate test kits to determine the soil nitrate nitrogen concentration in ppm.

INTERPRETATION OF RESULTS

Use the table below to make a sidedress nitrogen fertilizer recommendation.

Sidedress Nitrogen Recommendations for Corn Using the PSNT*,**
Corn Yield Goal,
grain (bu/A)/ silage (T/A)

Soil Test Level	100/17	125/21	150/25	175/29	200/33
(ppm NO ₃ -N)	Sidedress N Recommendation (lbs. N/A)				
0-10	100	130	160	190	220
11-15	75	100	125	150	150
16-20	50	75	100	125	125
21-25	25	50	75	100	100
25+	0	0	0	0	0

* Acknowledgement Pennsylvania State University.

** When more than 100 lbs. of sidedress N are recommended on very light sandy soils, apply half of the sidedress when the corn is 6 to 12 inches tall, and half when the corn is 18 to 24 inches tall.

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