FS 760

RUTGERS COOPERATIVE EXTENSION

NEW JERSEY AGRICULTURAL EXPERIMENT STATION

Presidedress Soil Nitrate Test (PSNT) Recommendations for Sweet Corn

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The Presidedress Soil Nitrate Test (PSNT) is an in-season soil test that provides information about the nitrogen (N) supplying capacity of a soil. In contrast to a traditional soil test, the soil sample is collected from the top 12 inches of soil when corn plants are 12 inches tall. Sampling at this growth stage allows the various factors that influence N availability to operate as long as possible before a sidedress fertilizer decision must be made.

Using the PSNT to determine the soil NO_3^- concentration just before the time of sidedressing can help sweet corn producers make better decisions about N fertilizer rates based on specific field conditions. The PSNT is particularly helpful in separating N fertilizer responsive fields from nonresponsive fields. The results of the PSNT sometimes indicate that the supply of N available in the soil is adequate to meet the needs of the crop, in which case no sidedress N would be recommended. In other instances the PSNT may indicate that the supply of N from the soil is not adequate and that sidedress N is needed.

The PSNT was initially developed for field corn based on research conducted in Vermont, Pennsylvania, and Iowa during the 1980s. Before use of the PSNT could be recommended for New Jersey, considerable effort had to be invested in the field calibration research to evaluate the PSNT and to enable correct interpretation for New Jersey soils. Replicated field trials to evaluate the PSNT have been conducted on sweet corn at 63 locations in New Jersey since 1991. Based on this research, Rutgers Cooperative Extension began recommending the PSNT for use on sweet corn in 1994.

The relationship between soil NO_3-N concentration and sweet corn yields from manured and nonmanured fields is shown in Figure 1. The PSNT critical concentration separates the soil into two classes: soils that are likely to respond to sidedress N and soils that are not likely to respond. Note that when the soil test level is greater than the critical concentration of 25 ppm NO_3-N, there is no response to sidedress N and no N is recommended.

When the PSNT is below the critical level and sidedressing is indicated to ensure full yield potential, the PSNT values provide a guide to the rates of sidedress N to apply (Table 1). It is reasonable to adjust these sidedress N recommendations upward or downward depending on the soil and weather conditions and the judgments of the producer. Based on experience, some producers may want to adjust the N recommendations upward on sandy soils and downward on fine-textured soils.

The PSNT is most useful for determining the need for sidedress N when sweet corn is grown on soils with a history of manure use or other soils

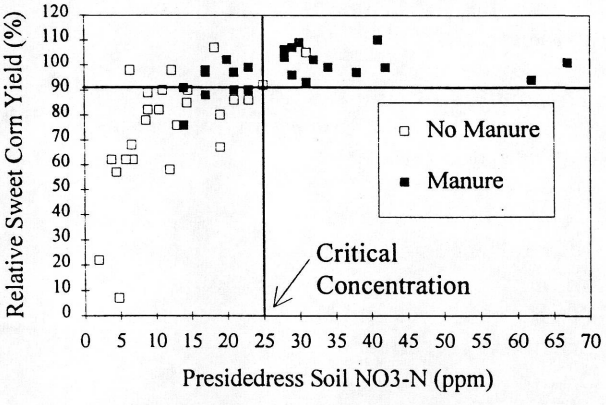

Figure 1. Yield as a function of soil NO3-N concentration.

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Table 1. Sidedress Nitrogen Recommendations for Sweet Corn Based on the PSNT Soil Test Level.

PSNT Soil Test Level (ppm NO3-N)	Sidedress N Recommendation (lb N/acre)*
0 to 10	140 to 160
11 to 15	100 to 120
16 to 20	60 to 80
21 to 25	20 to 40
greater than 25	0

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

rich in organic matter. It is also helpful to evaluate the N status of fields that received a preplant broadcast application of N fertilizer. **It is suggested that sweet corn growers should initially use the PSNT on only a limited number of acres.** Once sweet corn growers have experience and confidence in this new soil test they will probably want to expand use of the PSNT to additional acres, as has been the case among New Jersey field corn growers.

Cultural Practices for Use of the PSNT

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

1. Apply N only as starter (as 20-25 lb N/acre) at time of sweet 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 the potential for losses of N from leaching and denitrification.

2. The amount of N to sidedress depends on soil N availability at the 12-inch growth stage as determined by using the PSNT.

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.

Procedures for the PSNT

The procedures for the PSNT are different from traditional soil tests. Careful collection, handling, and drying of the soil samples is important to ensure the accuracy of the PSNT recommendation. Improper use of the test could result in false readings and incorrect N fertilizer recommendations.

1. Obtain a soil probe that can sample to a 12-inch depth and a soil nitrate test kit. See Fact Sheet 799 for a list of equipment and laboratories to perform the PSNT.

2. Sample soil when corn plants are 10 to 20 inches tall or about 1 week before sidedressing is planned.

3. Sample soil to a 12-inch depth. Collect about 20 cores at random from the row centers 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 soil samples, start to dry samples immediately. The samples can be dried by spreading the soil in a thin layer on a sheet of plastic 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 it is 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 parts per million.

7. Determine the amount of sidedress nitrogen needed based on the PSNT soil test level (Table 1).

Desktop publishing by Susan Lance and Kim J. Mayer.

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