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Wisconsin's Pre-sidedress Soil Nitrate Test

Scott Sturgul, Nutrient & Pest Management (NPM) Program

The large amount of rain some portions of the state have received in the spring of 2009 may have some corn growers wondering about the nitrogen (N) status of their fields. Is the N from earlier fertilizer applications still there? Are the manure-N or legume-N credits really available to this year's corn crop?

A diagnostic tool that can answer these questions is the pre-sidedress soil nitrate test (PSNT). The PSNT is a soil test available to Wisconsin corn growers for improving the efficiency of their N fertilizer applications. Not to be confused with routine soil tests, soil N testing allows N fertilizer application rates to be adjusted for field-specific conditions that influence corn N need.

The PSNT is most useful for confirming legume and manure N credits and providing site-specific estimates of soil N availability. The test is particularly important when information is not available to assess these credits using standard techniques, such as when previous manure application rate and/or nutrient content are unknown or when the stand density of a previous alfalfa (or other legume forage) crop is unknown. Another situation where the PSNT is of particular value is when abnormal weather conditions occur that may impact N mineralization rates (cool weather) or loss of N (excessive rainfall).

Soil samples for the PSNT are taken after planting when corn is 6 to 12 inches tall. At this stage of the growing season most of the conversion of organic N sources to plant-available forms of N has usually occurred. PSNT soil samples are collected to a depth of 1 foot at a sampling density of 15 soil cores per 20 acres. Cores are mixed to obtain a 1-cup composite subsample for submitting to the soil testing laboratory. PSNT samples need to be kept cool until taken to the lab. If samples are to be stored for more than two days, they need to be either air-dried or frozen to prevent changes in nitrate content during storage. The PSNT is not recommended on sands and loamy sands.

Because of the rapid growth of corn at this point in the growing season, it is imperative that PSNT soil sampling, lab analysis, and supplemental sidedress N applications (if needed) be completed within one to two weeks.

Results of the PSNT are interpreted using a critical value of 21 ppm nitrate-N. Fields testing above 21 ppm N are not likely to respond to additional N. Fields with PSNT values below 21 ppm N probably will benefit from additional N. The amount of N to apply to these fields is determined by subtracting the PSNT N credit (Table 1) from your target N application rate.

Table 1. Nitrogen credits for corn based on PSNT results.

| PSNT value | Soil yield potential ¹ | |
|----------------|--|------------|
| | Very high/high | Medium/low |
| -- ppm N -- | --- lb N/a --- | |
| > 21 | --- No Additional N is Needed --- | |
| 18-20 | 100 | 80 |
| 15-17 | 60 | 80 |
| 13-14 | 35 | 40 |
| 11-12 | 10 | 40 |
| < 10 | 0 | 0 |

¹ Soil yield potential ratings are assigned to each soil series found in Wisconsin. Soil-specific ratings can be found in UWEX publication A2809 *Nutrient application guidelines for field, vegetable and fruit crops*.

Other considerations when using the PSNT:

1. Corn following alfalfa - Abnormally cool spring weather can delay the release of N from legume residues. If a PSNT result for corn following alfalfa is less than 21 ppm nitrate-N, apply no more than 40 lb/a of supplemental N.

2. Corn following soybean - The PSNT does not work well in assessing the N contribution from a previous soybean crop and should not be used for this purpose.

The NPM Program has recently printed a pocket-sized card that discusses the PSNT and the interpretation of test results. The card be downloaded / viewed by clicking on the link below. Free hard copies are available from the NPM Program by e-mailing npm@hort.wisc.edu or calling 608-265-2660.

[To download / view the card, click here:](#)
[PSNT card](#)

Check Your Wheat Closely

Paul Esker and Shawn Conley, Extension Field Crops Plant Pathologist and State Soybean and Small Grain Specialist

Winter wheat is rapidly advancing around the state, based both on our observations as well as from various reports from across the state. We have received some questions and comments that growers are considering the application of foliar fungicides but that the plants are at flowering. It is very important that you closely examine the growth stage if considering the application of a foliar fungicide. For example, when we examined the winter wheat variety trial at Lancaster on 3 June 2009, wheat ranged from Feekes 10.4 (heads approximately 3/4 emerged) to Feekes 10.5.1 (anthesis) (Figure 1). **These assessments are critical because many of the fungicides that are commonly used for control of foliar diseases in winter wheat, including Headline, Quilt, Quadris, and Stratego, for example, are labeled only until the Feekes 10.5 (full head emergence). Applications made after this growth stage are considered off-label.**

Figure 1. Wheat head at flowering. This image was obtained on 3 June at the Lancaster ARS Winter Wheat Variety Trial. Image courtesy of Karen Lackermann.



Furthermore, pay particular attention to the severity of the different wheat diseases and on which leaf symptoms are observed. As we have recently discussed in the Soyreport blog and in the Wisconsin Crop Manager, the decision to consider a foliar fungicide at this point in the growing season for diseases like powdery mildew, septoria leaf blotch, and wheat leaf rust should be focused on the upper leaves. Also, make sure that you properly identify diseases, as we have seen some virus symptoms like *Barley Yellow Dwarf Virus* in plots (Figure 2). Foliar fungicides are not effective against viruses.

Fusarium head blight update:

As we move into flowering, remember that this is the critical period for infection by the pathogen that caused Fusarium head blight. From the initial phase of flowering to the end of flowering takes approximately **seven days**. **Based on recent weather conditions and the [Fusarium head blight prediction center](#), the current for Fusarium head blight (as of June 3) is low across the state in Wisconsin.**

We have also received some questions as to the current situation around the U.S. Our situation in Wisconsin is much better than other parts of the country, as the severity of Fusarium head blight further south, starting in southern Illinois and running into Arkansas and Kentucky, in particular, is high and there are concerns regarding the risk of high DON contamination.

Figure 2. Symptom of Barley Yellow Dwarf Virus. Image courtesy of Karen Lackermann.



Early Season Assessments for Soybean Stress

Paul Esker and Shawn Conley, Field Crops Extension Plant Pathologist and State Soybean and Small Grains Specialist

In 2008, we spent a great deal of time during the latter portion of the growing season visiting soybean fields that were under extreme stress. Specifically, we fielded many questions if the [Rps1k](#) gene conferring Phytophthora resistance was breaking down and also numerous questions regarding what we need to do to improve soybean yield in Wisconsin. From our sampling effort in 2008, we identified multiple pathogens including those that cause stem canker and charcoal rot as well as multiple species of *Fusarium*. This information was summarized over the winter in multiple sources and we recommend consulting those for a reminder and information regarding our observations (see references).

What we learned from last year, and a key point we emphasized during the winter meeting season was that many of these stresses may have started much earlier in the growing season, or were induced when plants were stressed by other abiotic or biotic factors. This hypothesis was further backed up with statements by growers and consultants that went, “Well, the plant looked stressed around V3 or V4, but I thought it would grow out of it.”

With soybean now moving into the early vegetative growth states, we want to emphasize that scouting fields earlier in 2009, when soybean is from the second trifoliolate (V2) to the fourth trifoliolate (V4), can help to determine if plants that are under stress are due to biotic organisms (some discussed below) or other factors, including environmental. While conditions this spring have been different from what we saw in 2008, taking the time to sample now is very critical to determine what may be one of the causes of soybean stress that could affect yield at the end of the growing season.

What pathogens might we be looking for? During this period of vegetative growth, it is important to assess fields for the effects of diseases caused by Phytophthora, Pythium, Fusarium, and Rhizoctonia. These organisms have overlapping characteristics but can be differentiated based on symptomology (see [Integrated Crop Management News from Iowa State University](#)). All can cause a lesion on the stem as well as a root rot, however, Pythium normally occurs in the cool, wet soils, while the other three organisms are more common in warmer, wet soils. Phytophthora, Pythium, and Rhizoctonia can all cause a seed rot (Figures 1-3), but that is less common for Fusarium.

For any samples that appear suspect, these can be submitted to the [Plant Disease and Diagnostic Clinic](#) for confirmation.

Figure 1. Field photo (top) showing plants that are under stress due to biotic factors (here, Rhizoctonia) and general evidence for a root rot of soybean.



Figure 2. Images of Fusarium root rot and Pythium damping-off.

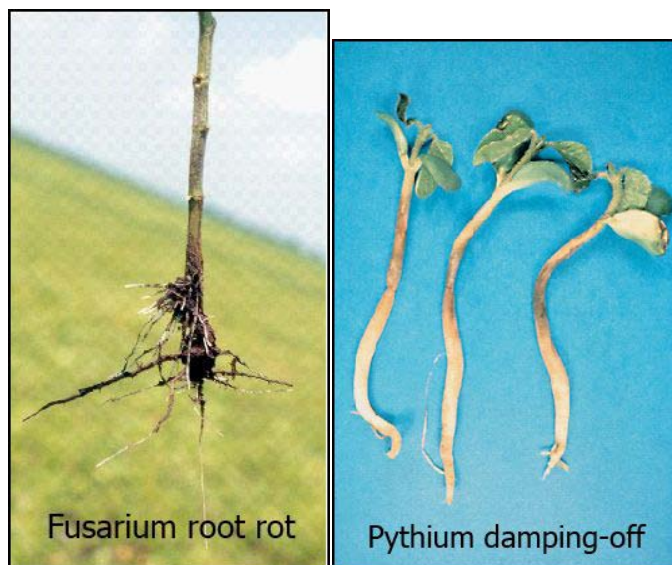
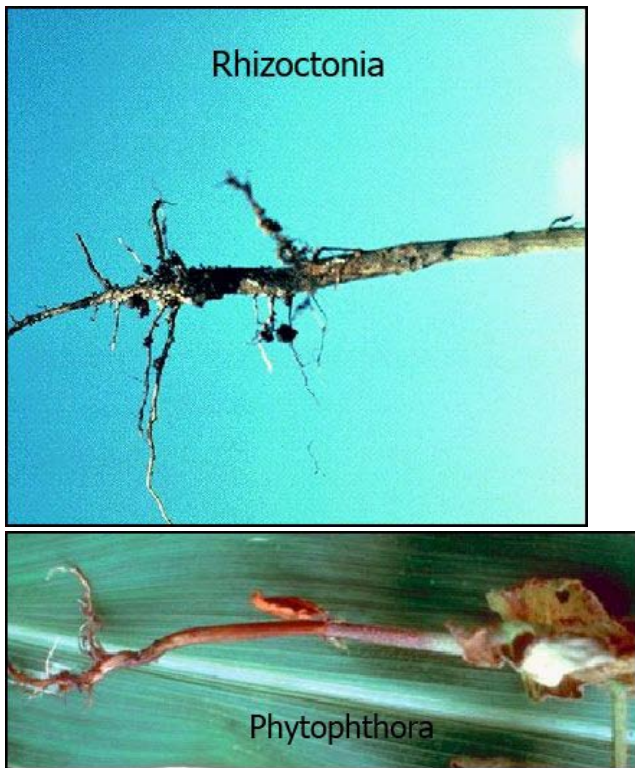


Figure 3. Images of Rhizoctonia and Phytophthora.



are turned back into fields. Comfrey is most likely spread by tillage since root fragments can readily produce new shoots. Despite the showy flowers, comfrey seldom produces seed.

Comfrey is difficult to control with herbicides. However, Jerry Doll, Emeritus UW weed scientist studied comfrey control from 2001 to 2003 and he found that an integrated management program can be successful. Jerry Doll's recipe for success is repeated here.

"Comfrey can be conquered. The formula for success is to 1) plan to use a no-till system and glyphosate resistant crops for two seasons, 2) plant comfrey-infested fields last to delay the burndown application of glyphosate as long as possible, 3) apply a low rate of a soil-active herbicide with the burndown treatment, 4) plant 3 days after applying the burndown treatment, 5) apply 0.75 lb ae/a of glyphosate when comfrey is well into the flowering stage (probably mid to late June) and 6) consider preharvest glyphosate applications if necessary."

If you are interested in more details on other herbicide options and trial results, an abstract of Jerry Doll's research is available at this site:

<http://www.ncwss.org/proceed/2004/proc04/abstracts/178.pdf>

Figure 1. Flowering comfrey shoots arising from thick taproots. These plants are close to 2 feet tall.



References:

1. Hughes, T., P. Esker, and S. Conley. 2009. Taking advantage of a stressful situation: stem canker and charcoal rot in soybeans. *Wisconsin Crop Manager*, Vol. 16, Number 2, Pages 9-11.
2. Hughes, T., P. Esker, and S. Conley. 2009. Did the *Rps* 1k gene fail in Wisconsin in 2008? *Wisconsin Soy Sentinel*, Spring 2009, Vol. 6, Issue 1, Pages 12-13.
3. Esker, P., S. Conley, J. Gaska, and T. Hughes. Charcoal rot – a disease of drought stressed environments. *Wisconsin Soy Sentinel*, Winter 2008, Vol. 5, Issue 4, Page 16.

Image Sources: P. Esker (UW-Madison); C. Grau (UW-Madison); American Phytopathological Society Image Galley; Iowa State University; University of Nebraska

Comfrey Questions

Chris Boerboom, Extension Weed Scientist

I've received a couple calls this summer asking for identification of a leafy green perennial with a large taproot (Figure 1.) The weed is comfrey and it is a very persistent, difficult to control weed. It had been planted in gardens in the past and was occasionally used as forage. Consequently, it appears in fields around Wisconsin, perhaps as old farmsteads

Start Scouting for Volunteer Corn

Chris Boerboom, Extension Weed Scientist

The increasing adoption of glyphosate-resistant corn (e.g. RR, GT) increases the potential for volunteer corn problems in soybean when glyphosate is used for weed control. After all, the resistance trait is inherited and is passed from one generation to the next. If you remember your biology or genetics course, a heterozygous corn hybrid (F1) is made when resistance is inherited from one inbred parent and the other parent is a conventional inbred. When this F1 hybrid is grown in a production field, all the plants are resistant, but the resistant trait is only carried in half of the corn plant's pollen and in half of the ovules (eggs). The F2 seed that is harvested will be a mix of resistant seed and conventional seed. The ratio should be three resistant seeds for each conventional seed. If any of this corn or ears fall to the ground and becomes volunteer corn, most will be resistant. The volunteer corn that was sprayed with glyphosate in Figure 1 shows this segregation. Six plants are resistant and 2 plants were killed by the glyphosate, a perfect 3:1 ratio. Clearly, volunteer corn where 75% of plants have resistance is too much to ignore.

Figure 1. Volunteer corn in soybeans that has segregated for the glyphosate resistant trait.



Fortunately, good volunteer corn control options exist in glyphosate-resistant soybean. Most postemergence grass herbicides (ACCase inhibitors) are very effective in controlling volunteer corn. The notable exception is that Poast Plus can be less effective. These herbicides can be tank mixed with glyphosate, but the adjuvant requirements may be greater than the typical ammonium sulfate (AMS) added with glyphosate and may depend if a glyphosate formulation is “loaded” (requires no additional surfactant) or “non-loaded” (surfactant is required).

Examples of herbicides for volunteer glyphosate-resistant corn control in soybean.

| Herbicide | Volunteer corn height | Rate/acre | Adjuvants |
|--------------------|-----------------------|-----------|---|
| Arrow | 0-12 inches | 4 oz | Add 1 pt/a crop oil plus 2.5 lb/a AMS |
| | 12-24 inches | 6 oz | Add 2.5 lb/a AMS if loaded glyphosate; 0.25% surfactant or 1 pt/a crop oil if non-loaded glyphosate |
| Assure II or Targa | 0-12 inches | 4 oz | Add 0.125% surfactant if loaded glyphosate; 0.25% surfactant if non-loaded glyphosate |
| | 12-18 inches | 5 oz | |
| | 18-30 inches | 8 oz | |
| Fusion | 0-12 inches | 4 oz | Add 0.25% crop oil even with loaded glyphosate |
| | 12-24 inches | 6 oz | Add 0.25-0.5% surfactant or 0.5-1% crop oil |
| Fusilade DX | 0-12 inches | 4 oz | Add 0.25% crop oil even with loaded glyphosate |
| | 12-24 inches | 6 oz | Add 0.25-0.5% surfactant or 0.5-1% crop oil |
| SelectMax | 0-12 inches | 6 oz | Add AMS if loaded glyphosate; 0.25% surfactant + AMS if non-loaded glyphosate |
| | 12-24 inches | 9 oz | |
| | 24-36 inches | 12 oz | |

The question of whether volunteer corn needs to be controlled depends both on the competition from the corn and the potential for dockage because of corn in the harvested soybeans. Based on previous studies, soybean yield loss from volunteer corn is probably in the neighborhood of 1% yield loss for every 75 to 100 “clumps” of corn per acre. This is a fairly low density. Preventing a 1% yield loss will probably pay for the cost of a grass herbicide to kill the corn.

Of course, a grass herbicide is not needed unless the previous year's corn hybrid was a RR or GT hybrid. Therefore, a key for success is record keeping and tracking hybrids and fields. If glyphosate-resistant volunteer corn is present in a field, a second question is when to apply the grass herbicide – with the first glyphosate application or with the second application if two are planned. I would be inclined to add the grass herbicide to the first application for the reason that the corn will be easier to kill with lower rates and to remove the corn so it competes less with the soybeans. The risk is that not all of the volunteer corn has emerged. However, the late corn is probably not going to be as damaging to soybean yields as the earlier corn and late corn is also less likely to produce mature seed. I can see arguments on both sides in terms of timing.

Volunteer glyphosate-resistant corn in this year's RR or GT corn cannot be controlled other than with cultivation. If this year's corn has LibertyLink (LL) resistance or is a LL stack, Ignite can be used to control or suppress volunteer glyphosate-resistant corn. Ignite may not kill all of the volunteer corn if it is too large, but it should severely stunt it. Similarly, volunteer LL

corn can be controlled with glyphosate. However, if last year's corn was a RR/LL stack, there are no herbicide control options.

UW-Extension/Madison Plant Disease Diagnostic Clinic (PDDC) Update

*Brian Hudelson, Ann Joy, Amy Gibbs, and Brooke Weber,
Plant Disease Diagnostics Clinic*

The PDDC receives samples of many plant samples from around the state. The following diseases/disorders have been identified at the PDDC since June 3, 2009;

| PLANT/ SAMPLE TYPE | DISEASE/ DISORDER | PATHOGEN | COUNTY |
|--------------------|---------------------------------|---------------------------|--------|
| FRUIT CROPS | | | |
| Peach | Peach Leaf Curl | <i>Taphrina deformans</i> | Dane |
| VEGETABLES | | | |
| Tomato | Fusarium Wilt | <i>Fusarium oxysporum</i> | Vernon |
| | Sunburn | None | Dane |

For additional information on plant diseases and their control, visit the PDDC website at pddc.wisc.edu.

