Crop Solutions that Work

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County Farm Centre

May 2015

Your May 2015 issue

Click on title to go directly to the article:

Early corn planting risks

- *Use soil temperature to guide crop planting.*
- *Cool soils may slow or distort corn growth.*
- *Slow growth can make corn vulnerable to seed and seedling pathogens.*
- *Cool soils may also lead to herbicide injury.*

Our number one concern with planting date usually is whether soils are warm enough to allow emergence of the crop. As this year again demonstrates, the calendar is an unreliable indicator for the best planting date.

Corn growth distortion caused by cool soils

For corn, we typically target minimum soil temperatures (four inch soil depth) between 10 and 13°C. Some agronomists prefer to see the soil temperature above 15°C. The soil temperature should be stable or rising. Remember that, early in the season, one cold rain shower can cause soil temperatures to plunge. Fortunately, improvements in early crop vigor and use of certain seed treatments, have allowed us to get by with early planting, or even profit by it.

Seed that is placed in a cool, moist environment will soak up (imbibe) moisture, even though it may not be warm enough to trigger germination. Some damage to cell membranes inevitably occurs during this process. Research has also shown that cell mitochondria may also be affected under these conditions. Rapid water uptake, under cool conditions, can reduce the protective nature of the seed coat, damage some embryonic cells, and allow entry of seed-rotting pathogens. Usually, if warm soils allow the seed to germinate rapidly and the seedling continues rapid growth, the developing corn seedling can often repair the early damage and escape problems from these pathogens.

A similar situation exists for crops that successfully emerge and begin growth, only to be slowed by a later period of cool and/or cloudy weather. Root and stem pathogens find this to be ideal conditions for infection. Actually, any type of stress that slows growth or diverts resources away from growth can cause increased disease infection.

Another common effect associated with chilling injury of corn seed and seedlings is distorted growth. Corn seed that imbibes cold water will often exhibit varieties of distorted growth. The most dramatic effect is to have the coleoptile shoot curl back on itself or just grow the wrong direction. We also often see the radicle or coleoptile fail to emerge or emerge and then stop growing. In some cases, the coleoptile sheath will rupture prematurely, as if it hit a compaction layer. Be aware that it is not only cold, moist soils that can cause early corn growth problems. Research has also shown that wide swings in day-night temperatures can also cause distorted growth.

Herbicides can injure corn seed or seedlings that are in cool, moist soils. A seed that germinates and grows rapidly can avoid a selective herbicide's harmful effects by metabolizing and breaking down the product. But, if emergence and growth is slowed by cool soil or air temperatures, the seed or seedling may be unable to effectively metabolize the herbicide, and injury results. Following corn emergence, a period of rapid growth allows equally rapid uptake of the selective herbicide. Then if a period of slowed growth (from cool or cloudy weather) intervenes, this can also result in increased crop injury.

Be alert for variable planting conditions

- *The soil thermometer belongs in every tool box this spring.*
- *Be alert to variable soil moisture and temperature.*
- *Once we get to mid-to-late April, soil temperature is less important. Go with the best soil conditions.*

Soil conditions remain largely cool and wet over much of the Midwest and there is growing impatience to begin fieldwork and to get the corn crop planted. Traditional triggers for Midwestern field activity have often been the Easter holiday and the middle of April on the calendar. These dates may have little significance under current weather conditions. The soil thermometer should be a better guide for initiation of corn planting this year.

There will be a great temptation to "follow the leader" on fieldwork this spring. However, it is important to remember how variable soil conditions may be at this time of year. Soil drainage is one of the most important factors to be considered. Side-by-side fields may warm and drain moisture at vastly different rates, depending on subsurface and surface drainage modifications. Fields that do not have tiles, or have old tile systems that may be partially plugged, could experience high variability in soil moisture and temperature within the field.

Soil organic matter can also significantly influence water holding capacity and also the speed at which the soil warms up. Darker soils may warm up faster than lighter colored soils but these darker soils may also be slower to dry, due to the water-holding ability of the organic matter. Soil texture is also very important. Coarse textured soils tend to drain more quickly than fine textured soils unless a compaction layer, high water table, or something else causes water to "perch" near the surface.

Tillage practices and crop history can affect soil drainage and temperature. The image on the left shows corn, planted at the same time, but with part on no-till corn residue and part on soybean residue. The corn on the soybean residue has a clear early growth advantage. In addition, because of surface residue and potentially increased soil bulk density, no-till fields tend to dry and warm up more slowly than conventional or reduced tillage.

As we approach late April, soil temperature becomes a lesser concern for planting than soil conditions and the calendar. Research has shown that yield potential starts to decline rapidly when planting is delayed beyond the first week of May. If the choice comes down to whether to mud the crop in before then or wait for better conditions, then best to be patient. If the yield clock has started ticking and planting must be done under less than ideal conditions, then at least the warmer soils should encourage faster emergence and fewer lasting problems for the crop.

Maximizing winter wheat yields depends on timely spring management of disease

Wet, cool weather and soft soil conditions have delayed normal spring management activities for winter wheat. As daytime highs move up to between 15 and 22°C with continued wet weather, the risk elevates for foliar diseases like powdery mildew, septoria, and rusts. Foliar diseases can cause yield losses of 10-30 per cent under such conditions. Preventative applications during the early vegetative stages may help suppress inoculum load, which will help protect the flag leaf. And flag leaf protection is critical, as the two uppermost leaves are responsible for the photosynthetic activity that drives head fill. Fortunately, we have a very effective set of fungicide tools to control foliar diseases in wheat, if they are applied timely.

The principles of Integrated Pest Management always apply: disease development requires a susceptible host, a pathogen, and favourable environmental conditions. The decision to control must weigh the economics of the crop, the expected yield loss, and the cost of the controls to be used. Here are some factors to consider when evaluating fungicide applications for foliar disease in winter wheat:

Weather forecast: If weather conditions from May through early June are expected to remain wet, with rainfall on two or more days per week and daytime highs between 20-27°C, conditions will favour the development of foliar disease.
Cultural practices: Nitrogen fertility programs geared toward high yields, fields with a history of foliar disease issues (inoculum present), rotations following corn or double-crop soybeans, and susceptible varieties all increase the risk for foliar disease issues.
Disease prevalence: Weekly scouting should begin at Feekes 4 (jointing stage) to check for the type of diseases present and whether those diseases are increasing in prevalence in the lower leaves. This is also a good opportunity to check for weed pressure and insects, most notably aphids.
Value of the wheat crop: High yield potential, wheat used for seed production, and higher market prices all drive economics toward a decision to apply fungicide.

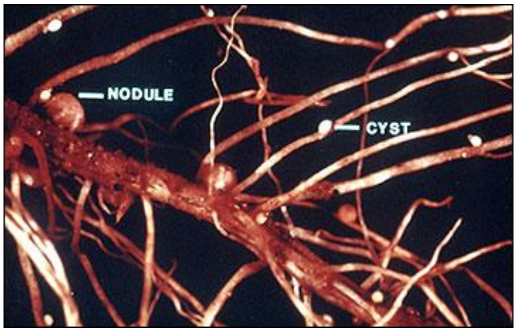
Strobilurins and triazoles or combination products are very effective at controlling foliar diseases in wheat. Common product choices would include Tilt, Pivot, Headline, Stratego, Quilt, and Twinline. Fungicide efficacy ratings for disease control in wheat are provided in the reference below from Purdue, which may help tailor your recommendations. If herbicide application has been delayed and not yet applied, the herbicide pass may provide an opportunity to tank mix fungicide. If foliar disease pressure is low early, then target growth stage Feekes 8 (flag leaf emergence) for a fungicide application. If disease prevalence is high or increasing rapidly, an early season application may be warranted to keep inocolum load in check. Remember to manage fungicide resistance by rotating chemistries from year to year in the same field. Refer to specific product labels for use precautions and restrictions. Remember, strobilurins should NOT be applied after Feekes 10.5 (head emergence) or to control head scab (fusarium head blight, FHB) due to the increased risk for vomitoxin accumulation in the grain. Products containing solely triazoles, like Prosaro and Caramba, are the products of choice for controlling FHB and are applied later at Feekes 10.5.1. FHB will be addressed in a separate article.
Reference: https://www.extension.purdue.edu/extmedia/BP/BP-162-W.pdf

Soybean Cyst Nematode pre-season considerations

- *SCN remains the most economically significant yield-robbing pathogen in soybeans.*
- *SCN needs to be managed with good decisions BEFORE planting.*
- *SCN population monitoring is the foundation of the management system.*
- *Crop rotation and resistant varieties are two key cultural management tools.*

Soybean cyst nematode (SCN), officially HSeterodera *glycines*, is the most economically significant pathogen of soybeans in the United States, accounting for an estimated 48 million bushels of yield loss annually. SCN is a microscopic roundworm that was first discovered in the US in 1954 and is now present throughout the major soybean growing regions of the US and the world.

The second stage juvenile infects the root, penetrates to the xylem, and establishes a feeding site, siphoning off plant nutrients for its own growth and reproduction. The females are about 1mm in length, lemon shaped, and noticeably smaller than *Bradyrhizobium* nodules (Figure 1). The female deposits 200-400 eggs in a sac, then dies, and her body forms a cyst, which can survive in the soil for many years and through harsh conditions. When environmental conditions are optimal for soybean growth, the eggs hatch and the life cycle is repeated.



SCN can reduce yield in an individual field by 40 per cent or more, reducing nutrients available to the plant as well as restricting root growth and suppressing nodulation. SCN feeding injury also provides a point of entry for other plant pathogens to infect the root system, most notably Sudden Death Syndrome (SDS). While the two pathogens are not interdependent, SDS symptoms are often more severe when associated with SCN infestation. Above-ground plant symptoms with SCN are non-distinct from many other environmental causes and typically involve patchy areas of stunted plants with some mild yellowing of leaves (Figure 2). Later in the season, these areas of the field may become noticeably chlorotic and senesce early, which can be readily observed via aerial photography using a UAV.

Image above: University of Missouri – SCN cysts compared to nodules


University of Missouri – Field with SCN symptoms

SCN cannot be eradicated and must be managed using a systems approach, which is centered around keeping populations at manageable levels. The foundation of your SCN management program should be a routine sampling and scouting program to understand population dynamics. SCN can become established in a field and cause significant yield reductions before any above-ground symptoms appear in the plants and routine sampling is the only way to achieve early detection and trigger SCN population management strategies. Distribution of SCN is patchy within a field and populations vary by season, which makes sampling a challenge.

Please see the provided references below for guidance on good sampling technique.

Management of SCN must be done mostly BEFORE planting. Management systems employ a combination of good cultural practices, such as crop rotation, avoiding additive stressors, controlling winter annual weeds, and selecting resistant soybean varieties. Crop rotation to non-host species again works to keep populations at manageable levels by disrupting the reproductive cycle. Because cysts can survive for many years in soil, rotation alone is not an effective strategy. Any practice geared toward establishing and sustaining good plant health (e.g. maintaining fertility, avoiding compaction, controlling weeds and insects, possibly foliar fungicides), will help the plant fend off yield losses due to SCN. Most commercially available soybeans have been selected for naturally occurring genetic resistance to SCN, but the vast majority is from a single genetic source, PI88788. SCN is gradually evolving around this mechanism, so soybean breeders are increasingly turning to alternative genetic sources to keep ahead of the problem. When SCN is an issue, always make sure that you are planting a variety that is highly rated for SCN resistance. In growing environments with high SCN population pressure or resistant races, resistant varieties alone may not provide adequate control.

American Phytopathological Society http://www.apsnet.org/edcenter/intropp/lessons/nematodes/pages/soycystnema.aspx
Iowa State University http://www.plantpath.iastate.edu/scn/
University of Nebraska-Lincoln http://nematode.unl.edu/scn/scnisu.htm

Dealing with soil compaction – Part 2: Remediation

Soil compaction is inevitable but we can limit the amount of compaction created in soils, and we can employ practices that reduce compaction over time. Once we recognize the type of compaction we're dealing with, and its sources, we're in a better position to reduce soil compaction and its effects.

Don't Do That! – The old joke: "Doctor, it hurts when I do this!" Response – "Don't do that anymore!" …can apply here. Avoiding unnecessary field traffic and avoiding field operations, when soils are most susceptible to compaction, will go a long way to improving productivity of soils. For example, keeping grain carts and grain trucks out of wet fields, and unloading combines more often, and at field ends, takes up precious time but pays great dividends in avoiding soil compaction.

Till Fields Strategically – Tillage, by its nature, tends to alter soil structure but it also has many critically important benefits. The key is to avoid *unnecessary* tillage, use the appropriate tool, and till when soils are fit for tillage. If you embrace no-till practices, avoid traffic on damp (field capacity moisture) or wet soils. Strategic tillage (deep ripping, etc.) can help break up some kinds of soil compaction (like plow pans) when done properly and at the right time. However, results are usually temporary unless the tillage practice is included as part of a total soil management system.

Manage Soil Moisture – Enhancement of soil surface drainage (if you are allowed to) and tiling to improve internal drainage can be very effective in improving soil productivity and reducing soil compaction. The latest subsurface drainage systems will also allow you to regulate the drainage process to help avoid over-draining of soils and also avoid seasonal offsite movement of soil nutrients, like nitrogen.

Limestone – Where adjustment (raising) of soil pH is called for, limestone has the added benefit of improving soil condition.

Crop Rotation – Crop rotation is recognized as having numerous benefits for insect, disease, and weed management, but crop rotation also offers benefits in improving soil quality. This is because of the effects of different root system growth habits in soils. Crop rotation may also help encourage healthy earthworm populations.

Cover Crops – We have seen a steady increase in interest in planting cover crops. Cover crops not only help squeeze out weeds and sequester excess soil nutrients, but they also protect the soil surface from erosion and reduce surface compaction of soil during rain storms. Cover crops may also improve soil structure with their root growth through the soil profile and through production of additional organic matter. Daikon, or tillage, radishes are noted for creating channels through compacted soil layers, but ryegrass and legume roots are also noted as compaction busters.

Rye-Radish cover crop

Forage Crops – Where the option exists, establishment of deep rooted forage crops, and maintaining the crop for multiple years, will greatly improve soil quality. Unfortunately, this option is not available for many growers.

Using multiple strategies, in a systems approach, to avoid and combat soil compaction will result in healthier and more productive soil. Together with other wise crop production practices, managing soil health can help result in maximized farm profitability.

For more information or discussion on any of the topics in this newsletter, please contact your local County Farm Centre FS crop specialist.

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