Crop Solutions that Work

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County Farm Centre

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Fusarium Head Blight (Scab) management summary

Fusarium head blight (head scab) decision factors...

- Optimum temperature range for head blight development - 24 to 30°Celsius.
- High humidity or light to moderate rainfall within the last few days preceding (and during) bloom (anthesis).
- Optimum growth stage for infection-(bloom initiation) and through the bloom period.
- Wheat is actually susceptible to infection up through the dough stage and secondary infections will occur once the disease is established.
- Highest risk is where wheat follows corn in rotation.
- Next highest risk is where wheat follows wheat.

Levels of scab infection in wheat are related to environmental conditions from the time just before wheat head emergence, through grain fill. Head scab sporulation and infection peaks at about 90 per cent relative humidity, with a range of temperatures between 15 and 30 degrees. (Optimum – 24 to 30 degrees) Peak wheat susceptibility to scab infection is from bloom initiation, through the bloom period.

Typical head bleaching from Wheat Head Scab

The pathogen, that causes head scab in wheat, produces mycotoxins. D.O.N., also known as “vomitoxin,” is the most common mycotoxin produced by wheat head scab, but zearlenone is another mycotoxin produced by this pathogen. Ironically, D.O.N. levels in wheat are not directly related to the amount of head scab symptoms. Small amounts of scab may produce large amounts of mycotoxin, and visa-versa. It is important to note that application of strobilurin fungicides after wheat head emergence can increase D.O.N. levels.

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Grain elevators have clearly defined limits for scab levels and mycotoxins. Wheat grain loads may be docked or refused based on these levels. When high wheat head scab levels are noted in the wheat crop, it is best to take aggressive measures at harvest. Scab-infected grain is often shriveled and lighter in weight than non-infected grain. Adjustments to the combine can help clean infected grain from the harvested sample and discharge it back onto the field.

If high levels of scab are measured in harvested grain, options are limited. The grain can be blended with healthy grain to bring scab levels below action levels, or it can be cleaned to remove much of the scabby grain. If the grain is cleaned, be sure to wear respiratory protection around the infected grain during the cleaning operation. The infected grain should be spread back on the field where it originated, or safely buried. Infected grain should not be stored, although mycotoxin levels should not increase if this grain is stored at 13 per cent moisture, or lower. Scab-infected wheat should never be saved for use as seed.

Although no wheat cultivars have been developed that offer complete suppression of head scab, some offer limited protection against the disease and new lines are continuously being released that should be considered for planting. Currently, the very best fungicides provide only about 50 to 60 per cent suppression of Fusarium head blight, or scab, in wheat. Burying wheat residue will limit inoculum release but this practice is ultimately impractical because of soil conservation concerns and because the scab inoculum also develops on other cereals, corn, and grass weeds.

Plant pathologists at Cornell University in New York State, along with other co-operating universities, have detected a head scab, *Fusarium graminearum*, isolate that is highly resistant to Tebuconazole, the active ingredient found in Folicur, Prosaro, and some other fungicides. The implications of this finding should be clear. Tebuconazole, or premixes containing tebuconazole, are our primary means of managing head scab. These fungicides should be used selectively against diseases in wheat and other crops. The Cornell researchers found that the head scab isolate, with resistance to tebuconazole, remained susceptible to metconazole.

Fusarium Head Blight symptoms on wheat

Mixture of sound and scab-infected wheat

Soybean growth facts

- When the expanding soybean hypocotyl lifts the cotyledons above the soil surface, sunlight causes the cotyledons to turn green and triggers growth of the unifoliate leaves, also stopping hypocotyl expansion.

- Cotyledons normally feed the developing plant for only about a week after emergence, but may do so longer under stress conditions. The cotyledons provide both stored nutrients and limited photosynthetic nutrients.

- Loss of terminal buds or leaves while cotyledons are still attached will trigger development of new axillary buds at the junctions (axils) of the cotyledons and stem.

- Soybean leaf tissue is much more cold tolerant than corn leaf tissue. Since the soybean growing point is always above ground after emergence, however, soybeans may suffer more from a late cold snap.

- The nitrogen-fixing root nodules on soybean roots normally begin to form within a week after plant emergence. The nitrogen-fixing bacteria will supply most of the young plant's nitrogen requirements 10 to 14 days after formation. This process is inhibited in soils that are either too cool or too hot. The presence of soil nitrogen will also inhibit nodule formation.

- Nitrogen fixing root nodules last about six to seven weeks each, but new ones continue to be formed through pod fill. Active nodules are a salmon color in the middle. These nodules tend to become inactive or die during hot, stressful periods of the summer and become olive colored in the middle.

- If weather or pests causes destruction of the terminal bud of the soybean plant, buds in the lower leaf axils may reconfigure to become new stem branches. Leaf axils over the entire height of the plant are also the sites from which flowers will arise.

- Soybeans have three growth habits: **determinate** vegetative growth stops when flowering is initiated; **indeterminate** vegetative growth continues long after flowering begins; and **semi-determinate** vegetative growth continues after flowering begins, but stops earlier than with indeterminate varieties. Determinate varieties are more popular in the south because they remain shorter and resist lodging. Indeterminate and semi-determinate varieties are more popular in central and northern areas but some indeterminate varieties are now adapted and becoming more popular in the south, as well.

- Indeterminate soybean varieties may bloom over a period of several weeks, while determinate varieties may have all flowers open in just a few days.

- Flowering in soybeans is triggered by daily hours of darkness. Since nights (at the time of the summer solstice) actually are longer as you go south, moving a variety south from its adapted zone may cause it to bloom earlier. This is why we recommend staying close to adapted maturities, even with late planting or double-crop soybean production. In many cases, with late planting recommendations, a slightly fuller season variety is suggested.

- Narrow row spacing is preferable for late-planted or replanted soybeans. The closer proximity of these shorter plants in narrow rows allows for better utilization of sunlight.

- A period of stress may cause flowering of indeterminate and semi-determinate soybean varieties to slow or stop. On occasion, we have seen these soybeans renew both vegetative and reproductive growth with the return of favourable conditions. Although this demonstrates the adaptability of some of our modern varieties, the presence of both dry beans and “butter beans” on the same plant makes for difficult harvest and lower grain quality.

- Some soybean varieties are known to produce enough flowers to theoretically produce 250 bushel yields. While this unrealized yield potential is often a concern of soybean breeders, most recognize that this is simply a useful trait that helps the soybean tolerate periods of stress while maintaining a base reproductive potential.

Soybeans emerging

Healthy soybean nodule sliced open

Weedy fields and black cutworms

Significant or intense captures of black cutworm moths are being reported from some areas. However, there is no way to accurately predict where the cutworm moths will descend out of weather fronts. Even if you are monitoring black cutworm moth flights with your own pheromone trap, you cannot be absolutely certain of where cutworm eggs are being laid. There are, however, certain behavioral characteristics of black cutworm moths that we can use to help estimate the risk to a particular field.

Black cutworm moths do not like to lay eggs (oviposit) on bare soil or even in weed-free corn fields. They prefer soybean residue if there is no green weed growth available, but will almost always go to green weeds to lay eggs when these weeds are present. A master list of preferred weed hosts is not available but we know that chickweed, curled dock, yellow rocket, henbit, and other winter annual or early spring annual weeds are regarded as desirable food hosts and oviposition sites for black cutworm moths.

When corn is planted into weed cover and burndown herbicide applications are then made, the risk to the emerging corn can be great. As the weeds die, they lose attractiveness for cutworm larval feeding. Yet, the dying weeds can serve as food for the cutworm larvae for well over a week, longer under cool conditions, often long enough for emerging corn to be at risk. A similar situation exists when weeds are tilled down just ahead of corn planting. The dying weeds can also serve as food in this situation until the corn emerges.

Cutworms gain size and toughness when they have fed on weeds before moving over to corn. Even when the corn features a Bt (Lepidoptera) trait and/or Cruiser, Poncho, or Gaucho insecticide seed treatment, these larger cutworms are not as susceptible to the trait or seed treatment as are the smaller worms. Although indiscriminate insecticide use should be discouraged, the risk from cutworms getting a healthy start in weeds should not be ignored. In fact, the closer the weed control efforts are to corn planting, the more risk exists for cutworms to move from weed growth over to corn. Under these circumstances, addition of an insecticide to the herbicide burndown mix is probably a reasonable choice.

Cornfields should be closely monitored from the time of emergence, to a few weeks after emergence. Timely detection of early black cutworm damage in corn allows adequate time for rescue insecticide treatments, with little or no loss of yield.

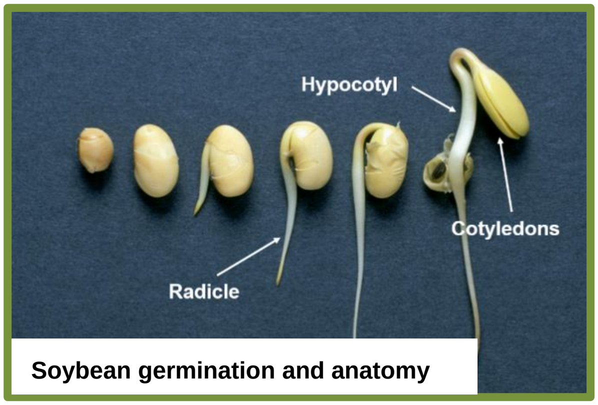
Look for early evidence of black cutworm activity

Common Chickweed – A favourite of cutworm moths

The soybean Hypocotyl and Hypocotyl Arch

There is a tendency to compare the mesocotyl of the corn plant and hypocotyl of the soybean plant and there are some similarities. For example, with corn the lengthening mesocotyl pushes the coleoptile to the soil surface. With soybeans, the lengthening hypocotyl drags the cotyledons and growing point to the soil surface. However, this is about the limit of the similarities. Here is a summary of soybean germination, emergence, and the importance of the hypocotyl…

The soybean seed contains embryonic structures that will develop into the typical soybean plant. Three recognizable embryonic nodes are present in the seed and include the cotyledon node, the unifoliate node, and the first trifoliate node. Initial cell division begins about 36 to 48 hours after the soybean seed imbibes water. The first recognizable structure to emerge from the soybean seed is the radicle. The radicle grows downward and initially anchors the seedling for the next phase of growth. Once the radicle has emerged and anchored the seedling, the hypocotyl begins elongation and drags the cotyledons (seed leaves) and growing point to the soil surface.



Soybean germination and anatomy

The top of the hypocotyl forms a bend or “arch” as it drags the cotyledons to the soil surface. If an insect or pathogen attacks the hypocotyl arch, or if the soil is compacted, the arch may break. When this happens, the soybean plant is finished. In the same way, if the hypocotyl, itself, is damaged by pest feeding, disease infection, or mechanical injury the whole emergence process can come to a halt and the soybean seedling is finished.

Swelling of the hypocotyl is symptomatic of soil compaction or sometimes herbicide injury. A number of pests may attack the growing hypocotyl. These may include white grubs, cutworms, seedcorn maggots, slugs, millipedes and others. Pathogens that are known to attack the soybean hypocotyl include Pythium, Phytophthora, and Rhizoctonia. Some of these pests also attack the hypocotyl arch.

Hypocotyl Arch beginning to straighten and lift

Under favourable growing conditions, the hypocotyl (with its arch at the top) drags the cotyledons and growing point upward until the hypocotyl arch is exposed to sunlight. When light hits the hypocotyl arch, the arch straightens and lifts the cotyledons and growing point free of the soil surface. Continuing cell division results in familiar stem growth and node development, with the cotyledon node followed by the unifoliate node, followed by the first trifoliate node.

The cotyledon and unifoliate nodes are at opposite sides of the stem. The first, and subsequent, trifoliate nodes are all in an alternate arrangement on the stem.

Under favourable soil conditions, the soybean hypocotyl was historically capable of lengthening far enough to foster soybean emergence from a seed planting depth of four inches. However, newer soybean varieties may only be capable of emerging from depths a little over two inches. This apparent reduction in hypocotyl elongation does not appear to have been intentional but is a by-product of selecting for higher yielding genetics. In any case, soybeans should not be planted deeper than two inches, and one to one and a half inches may be more reasonable. When in doubt, test a variety's capacity for hypocotyl elongation by planting representative seeds in field soil in a bucket or pot prior to planting the seed in the field.

Soybean populations and emergence considerations

Growers often plant soybeans at populations much higher than necessary for optimum yields. Reasons cited for this often include such things as that the extra plants will aid the emergence of their neighbours, or that the extra seed is not really that expensive and it doesn't seem to hurt. Research has shown that there is usually little reason for planting soybean seed at populations above 150K per acre in 30 inch rows. In fact, there is much research that shows that near optimum yields can be obtained with soybean populations of 100K or less.

When planting soybeans in row widths of 15 inches or less, particularly in heavy-textured soils, it is sometimes beneficial to plant soybean seed at rates between 165K and 220K. This can contribute to more uniform emergence and sometimes to faster canopy closure, though not necessarily to higher yields. In fact, Purdue University recommends planting about 210K seeds per acre in seven inch rows, 163K seeds per acre in rows spaced between 11 and 20 inches, and 131K seeds per acre in row spacing above 21 inches.

Be sure to check soybean seed bag tags for warm and cold germination percentages, and adjust seeding rates accordingly. When planting soybeans early for your area, a quality seed treatment may provide a slight positive edge for stand establishment

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

County Farm Centre