Walking Your Fields®

Welcome to the second issue of *Walking Your Fields*® newsletter for the 2015 growing season. On behalf of your DuPont Pioneer Agronomy team, we will be producing this newsletter on a monthly basis through to October. For more detailed agronomic information, please feel free to contact your local Pioneer Hi-Bred sales representative or check out ***www.pioneer.com***.

Corn Seedling Diseases Can Reduce Plant Vigor and Stand

The ideal environment for most soil borne diseases that attack corn seeds and seedlings is wet and cool (10°C to 15°C). Under these same conditions, corn develops very slowly. For example, when the soil temperature averages only 13°C, corn seedlings require over 20 days to emerge. Fungicide treatments applied at label rates to protect the seed during germination and emergence have good efficacy for approximately 10 to 14 days. Slow emergence stretches the limits of fungicide seed treatments and makes seeds vulnerable to attack.

Soil-inhabiting disease organisms that attack corn seeds and seedlings include *Pythium, Fusarium, Rhizoctonia, Penicil-lium, Colletotrichum, Diplodia* and others (figure 1). Each of these fungal genera consists of at least several species that can differ in pathogenicity and environmental influences. Of these, *Pythium* has gotten the most attention recently because it is perceived to be increasingly detrimental to corn stand establishment.

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Pythium, a "water mold" that survives in soil and plant debris, is an otherwise weak pathogen that tends to predominate under very wet soil conditions. *Pythium* is one of the first groups of fungi to attack corn in the spring, due to the low temperature optimum of some species. Cool soil temperatures of 10° to 15°C favor several *Pythium* species that are common in northern areas, particularly in early-planted fields. But the various species of *Pythium* are actually active over a wide range of temperatures.

Figure 1. Dark discolouration of the radicle root of corn seedling indicates the beginning of seedling disease.

Other seedling pathogens like *Fusarium* and *Rhizoctonia* do not require extremely wet conditions in order to cause disease. *Fusarium* is a ubiquitous soil-borne group of fungi that can be found, to some degree, on the majority of corn plants suffering from seedling diseases. *Rhizoctonia* is another very prevalent fungal group with a wide range of plant hosts. This helps explain why multiple pathogens are invariably involved when a corn plant succumbs to seedling disease. In fact, pathologists often have difficulty even determining the primary pathogen. This is because dying seed or seedling tissues below ground are rapidly colonized by a variety of fungi, all of which contribute to the decay. Consequently, it is more correct to think of corn seedling disease as a complex of fungi that must be controlled as a group. This is practical because management strategies are largely the same, regardless of the pathogen involved.

Whole Field Symptoms

On a field level, seedling disease may be slight to severe. Early symptoms of slow growth, chlorosis, stunting and missing plants may be followed by near complete recovery if favorable conditions allow corn to outgrow the injury.

But if cold, wet conditions continue, symptoms often worsen and stands decline. Missing plants may be in patches or scattered among other plants. Often, a chlorotic, stunted plant will appear next to a healthy one (Figure 2). Symptoms may be more noticeable in low-lying areas of the field. These are not typical symptoms associated with other seedling problems such as fertilizer or herbicide injury, nutrient deficiency, or restricted growth due to compaction or crusting.

Figure 2. Healthy plant (right) next to olant killed by seedling disease (left).

In extreme cases, replanting the entire field or affected field areas may be necessary. Even when replanting is not required, diseased fields often have reduced yields due to low plant population, uneven plant growth and reduced plant health and fitness. Stunted plants surrounded by healthy plants may be uncompetitive and fail to produce an ear. Rotted roots seldom recover entirely, resulting in plants that are less able to withstand later stresses such as drought, storms, insect feeding, and stalk rot development.

Seed and Plant Symptoms

Soilborne pathogens may attack seeds and seedlings both before and after plant emergence, as well as the roots and mesocotyl of emerging or established plants.

Seeds: In some cases, seeds may rot prior to germination. Affected seeds are often soft, discolored and overgrown with fungi. Rotted seeds decompose very rapidly and may be difficult to find. Soil adhering tightly to the decomposing seed may help to obscure it.

Pre-emerged seedlings: Oftentimes, the seed germinates but the seedling is killed before it emerges from the soil. The coleoptile and primary roots may be discolored and have a wet, rotted appearance.

Post-emerged seedlings: Seedlings may emerge through the soil surface before developing symptoms. Plants affected at this stage may grow more slowly than surrounding, healthy plants and appear chlorotic (yellow), stunted or wilted. In severe cases, "damping off" of seedlings may occur. Damping off generally refers to rapid wilting and death of seedlings as soft rot collapses the stem, often at the soil line. *Pythium* and *Fusarium* are the most common fungi associated with seed rot and damping off of corn.

Roots and mesocotyl: Discolored, sunken lesions may be evident on the mesocotyl, which eventually becomes soft and water soaked (figure 3). The root system is usually poorly developed and discoloured, and water soaked roots may slough off. If the primary root system and mesocotyl are severely affected before the nodal or permanent root system has developed, the plants have little chance of survival.

Figure 3. Symptoms of corn seedling disease on seed, mesocotyl and root .

For further diagnosis of plants with above-ground symptoms, carefully dig up living plants, wash the soil from the roots, and look for rotted tissue and discoloured lesions on the plant stem, crown and roots. Discoloration may range from whitish-pink to gray, to dark brown or black, or even greenish-blue, depending on the array of pathogens involved.

Herbicide Timing: Is Earlier Better?

No matter which crop is grown, the question is the same: when is the best time to spray to control weeds? Often field conditions, poor weather, access to equipment or custom operators, or other responsibilities on the farm dictate when a crop gets sprayed.

Canola

The Canola Council of Canada states that several research studies conducted across Western Canada outline the advantages of early weed control in canola. Trials conducted by the University of Manitoba show weeds that emerged after the 4-6 leaf stage cause insignificant yield loss in canola. Few weeds emerged after the 4-leaf stage and those few that did were spindly and weak, not competing with established canola stands. Alberta Researchers confirmed these observations: early spraying results higher yields (Figure 1).

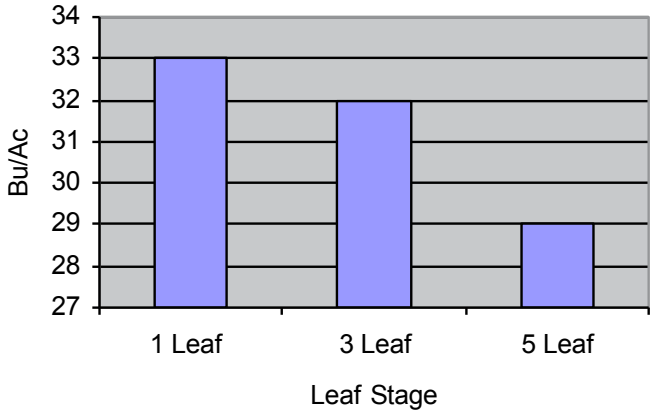

Figure 1: Effect of Time of Weed Removal and Yield of Canola in Alberta Fields (average of all trials)

Results from this study showed a 3 bu/ac yield increase by spraying at the 1-leaf versus the 5-leaf stage. Concentrate on early emerging weeds and worry less about the weeds that come up after the crop hits the 6 leaf stage. If crop development is delayed, a second application may be required to control flushing or late emerging weeds. By applying herbicide early, enough time is allowed to control the second weed infestation and not exceed staging restrictions.

For example, glyphosate applications on canola are labeled between the cotyledon and 6-leaf stage on glyphosate tolerant canola. When applying early (cotyledon to 2-leaf stage) a second application may be applied up to the 6 leaf stage. Under a CLEARFIELD® canola system, early herbicide application not only controls weeds while they are small, but the residual effectively covers the crop until the 6 leaf stage where canola can out-compete emerging weeds. No matter which herbicide system you are using for weed control, early application can lead to less early weed competition resulting in higher yields.

Corn

In general, weeds that emerge with corn must be controlled within 2 to 5 weeks after weed emergence to prevent a yield loss due to weed competition. However, research has shown that controlling weed infestations in corn prior to the weeds reaching a height of 4" will not produce a significant yield reduction. Figure 2 depicts that after a weed canopy reaches 4" the yield loss becomes significant.

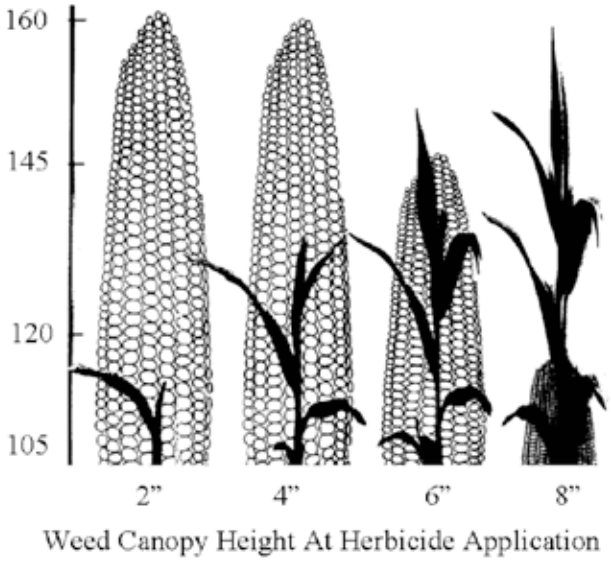

Figure 2: Effect of herbicide timing on corn yield

Soybeans

The use of glyphosate on soybeans is a useful tool for farmers to control weeds up to flowering. However, controlling large weeds (6-8" tall) should not be considered a standard weed management practice. Weed interference may cause irreversible yield losses before such weeds are eliminated. A general survey indicates that "soybean yields are reduced only slightly when weeds are present for as much as 4 to 6 weeks, but the rate of yield loss increases rapidly when the weeds are present longer". This "critical duration" of weed interference is also influenced by weed species, weed density, climate, environment, and other factors. Under some conditions, irreversible yield loss due to weed competition can begin in as little as three weeks after planting soybeans. The usual recommendation, therefore, is to control weeds as early as possible to minimize the risk of yield loss. A second application of glyphosate may be required to control escapes and flushing weeds.

Assessing Alfalfa Stands:

The decision to keep an alfalfa stand or replace it is a difficult choice for alfalfa growers every year. To properly assess forage stands, plants need to be dug up. Look for leaf and bud development, resistance to bark peeling and a good internal root color (white to cream colored). Plants with broken lateral roots have poor chances of survival, particularly in a dry spring.

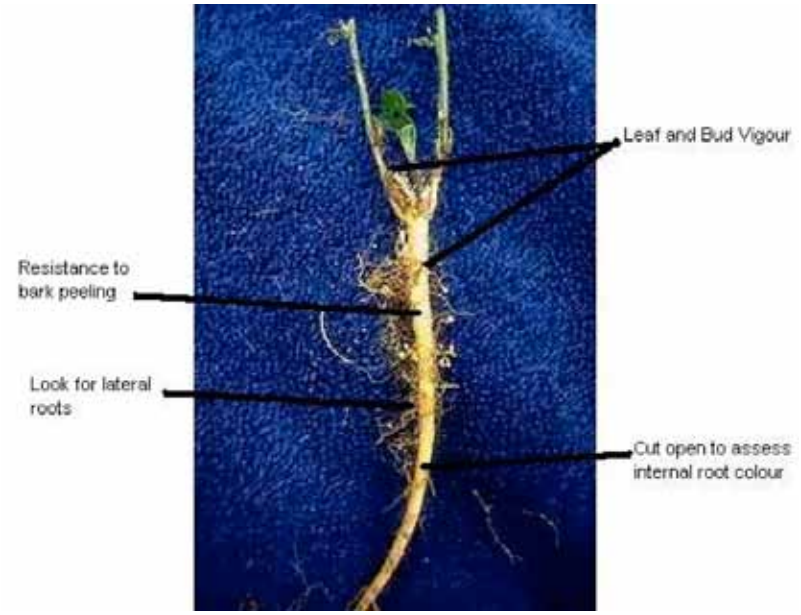

Figure 1: Assessing alfalfa plant health

Estimating Yield Potential of Alfalfa: Alfalfa can attain maximum yields over a range of plant stand densities. Therefore plant density is a poor estimator of yield because individual plants range in the number of stems produced. Stem density is the best indicator of yield potential. Figure 2 gives an estimate of potential yield of an alfalfa stand relative to the number of stems. Table 3 outlines the yields potential of an alfalfa stand based on the number of stems per square foot.

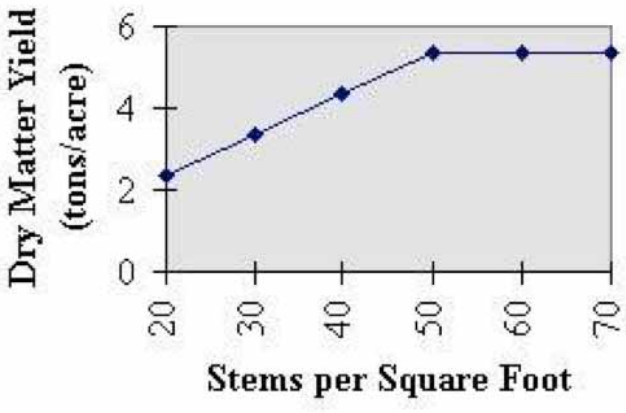

Figure 2: assessing alfalfa plant health

Stems/ft²	% of Maximum Yield
> 55	100%
40 to 50	75% to 92%
< 40	Replace Stand

Table 3: Yield potential based on the number of stems/ft²

The following table outlines the minimum number of healthy plants/foot² for a desirable alfalfa stand based on stand age:

Establishment	20+ Plants/ft²
Year 1	12 – 20 Plants/ft²
Year 2	8 – 12 Plants/ft²
Year 3 or Older	5 Plants/ft²

Table 4 : Plant Count (# per square foot)

To assess an alfalfa stand, count the number of plants to estimate the stand density. The best time to do plant counts is in the spring after the plants have broken dormancy to assess the health of the plants in the stand.

Other factors to consider when assessing alfalfa stands:

- other forage species in the stand
- your forage needs throughout the year
- alternative forage options
- crop rotation
- availability of equipment options in the area

Cutworm Assessment and Identification

Assessment of Cutworms and Damage

- Cutworm management requires regular scouting. Larvae are typically found under litter or underground as deep as 4 inches. Some species may come up at night or on overcast days to feed on above ground plant material. When touched, all cutworms will curl up into a ball.
- Scout fields every 3-4 weeks during the first few weeks of crop development.
- Feeding typically begins on south facing slopes or hilltops where the soil warms up first and the soil texture is light.
- Under cool spring conditions, the feeding period may last longer than under warm spring conditions.
- Threshold levels of cutworms exist at about 3-4 cutworms/m^2 or 25-30% reduction in canola stand.

Wilted plant as a result of below ground feeding.

Leaf tissue missing as a result of cutworm feeding.

Symptoms and Management

- Signs of cutworm feeding include notches to complete removal of foliate, plants that are wilted, tipped over or clipped and bare patches in the field. Start digging in areas where field symptoms are observed to find cutworms.
- If green material is found in the gut of the cutworm, then it has been actively feeding. You may find green material called frass (cutworm excrement) in the soil as well.
- If orange pupae are found, then the cutworms have stopped feeding and will no longer be a threat for the current year.
- To help reduce cutworm populations:
  - Remove winter annual weeds or cultivate at least 1-2 weeds prior to seeding to help starve early larvae.
  - Control flowering plants in the fall. Adult moths are attracted to flowers in August and September and lay eggs in these areas.
  - Moths prefer soft soil for laying eggs. Avoid working the soil in July and August to help prevent egg laying.

Orange cutworm pupae and green cutworm frass.

Cutworm Identification

Army Cutworm: Greyish-black with different patterns of gray and brown stripes. Overwinter as larvae, so out early in the season and will feed on canola from emergence through late June. Feed mostly on leaf material. More common through W. Saskatchewan and Alberta.

Bristly Cutworm: Dull gray-brown with stripes along the sides and diamond shapes down the back. Stiff hairs protrude from all parts of the body. Hatches from eggs in the spring and feeds near the soil surface. More common in Saskatchewan and Alberta.

Dingy Cutworm: Pale gray to brown with dark V-shaped markings on the back of each abdominal segment. Overwinter as larvae, so out early in the season and will feed on canola from emergence through late June. Feed mostly on leaf material (rarely stems). Located throughout Western Canada.

Glassy Cutworm: Green-white body that appears glassy or translucent. The head is red-brown. Will feed on canola but tends to prefer cereals. More common in the Peace region in Alberta.

Pale Western Cutworm: Yellow-brown with three pairs of green-gray stripes along the back and sides. Head is amber to black with a black marking on the front that resembles an inverted V. Hatches from eggs in the spring and feeds on stems below the soil surface. Larvae will move down rows feeding underground and cutting off plants. Prefer drier conditions throughout W. Saskatchewan and Alberta.

Redbacked Cutworm: Light brown to gray with two red bands bordering a light, medium stripe on the back. Head is yellowish brown. Hatches from eggs in the spring and feeds on plants at the soil surface. Will feed on both foliage and stems. Larger larvae tend to prefer the stem. More common in E. Saskatchewan and Manitoba.

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