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Is it Downy Mildew or Bacterial Blight in my Soybeans?

Albert Tenuta, Field Crop Plant Pathologist, OMAFRA, Ridgetown

A number of questions have been coming in concerning these tow diseases and how to distinguish between them. Both diseases occur throughout the province and in most years have a minimal impact on yield unless a very susceptible variety is grown. We have seen yield losses and seed quality problems however when environmental conditions are cool, wet for a prolonged period like this summer and it is no surprise the incidence of these diseases in higher this year as a result.

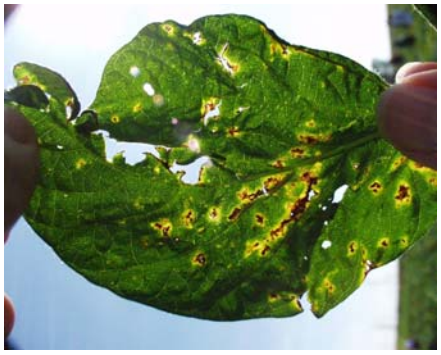

Figure 1. Bacterial blight identification can be enhanced by holding leaf to the sun.

Bacterial Blight - The bacteria survives on seed and crop residue and is spread to the upper leaves primarily through rain splash, wind, and plant injury (hail, insects, mechanical, etc). There are different physiological races in the province. The disease appears as red or black coloured lesions with a yellow halo and a shiny centre which are produced on the leaves of infected plants. Symptoms often disappear

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under dry, hot conditions. Infected seed often has a water-soaked discolouration starting at the helium which can reduce seed viability and reduce germination. Bacterial blight management includes, 1) Crop rotation with corn, wheat, etc; 2) Removal of crop residue; 3) Avoid being in the field while the leaves are wet and 4) planting a tolerant variety but none are resistant to all physiological races. Remember we are talking about a bacteria and a fungicide does not control bacterial diseases.

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Downy Mildew – The fungus survives in infected leaves and on seed. Air-borne spores blown into Ontario from the U.S. are the most common cause of infection however planted seed covered with downy mildew mycelium, and infected residue can contribute to the problem. Downy mildew appears as yellow-to-brown spots on the upper leaves during late July through September. In moist weather, a pale blue-to-grey, mildew growth of the fungus appears on the lower leaf surface, directly under these spots. Severely affected leaves may drop prematurely. Whitish growth of the fungus may encrust the seeds, affecting even healthy pods. Planting infected seed may result in diseased seedlings. Removal of crop residue and rotation with non-host crops such as corn and wheat will help prevent both diseases. Fungicidal seed treatments will reduce seed-borne downy mildew. Refer to OMAFRA Publication 812, *Field Crop Protection Guide*, for recommended products.

Figure 2. Downy Mildew symptoms on upper leaf surface

Giant Hogweed in Ontario

Mike Cowbrough, Weed Management Lead, Field Crops, OMAFRA, Guelph
Francois Tardif, Associate Professor, University of Guelph

If you see Giant Hogweed, **DO NOT TOUCH IT**. Giant hogweed can be a serious health hazard. Its watery, clear sap contains photosensitizing compounds (furanocoumarins), which, when in contact with human skin and in combination with UV radiation, can cause burning. Content varies depending on plant part, but contact should be avoided at all times. The reaction of the skin depends on individual sensitivity. After 24hrs, reddening and swelling of the skin can be noticed, which is followed by an inflammatory reaction after 3 days. Depending on individual sensitivity, effects can last for months and skin can remain sensitive to UV light for years.

Figure 1. Giant Hogweed

Giant Hogweed is a short lived perennial weed that reproduces only by seed and is predominantly found along rivers, streams and wet land areas, but can also be found in pastureland. The key to long term management of Giant Hogweed is to limit seed production. Often people will attempt to cut the flowering head off in hopes of limiting seed production. However at this time of year, most flowering heads of giant hogweed have already set mature seed (seed Figure 3). Therefore cutting off seed heads now will only put you at risk of coming into contact with the clear watery sap while helping the plant spread its seed around. Preliminary research conducted in cooperation with OMAFRA, the University of Guelph and John Benham (County of Wellington) has shown that the optimal time to control Giant Hogweed is in late April to Early May since plants are small and easier to manage. A 2% glyphosate solutions spot applied to young plants can be effective. More information on this species can be found at www.ontarioweeds.com

Figure 2. Leaves of Giant Hogweed

Figure 3. mature seed on Hogweed plant

Sclerotinia (White Mould) of Soybeans!

Albert Tenuta, Field Crop Plant Pathologist, OMAFRA, Ridgetown

White mould symptoms are beginning to appear in may parts of the province due to the favourable weather conditions this summer. The prolonged cool and wet conditions during flowering are often ideal for white mould development especially in fields with a history of the disease. Although July was the third coolest month on record for most of the province (1992 being the coolest and then in the 1880s) many of the bordering US Great Lake states experienced their coolest month on record (figure 2).

Figure 1. White mould symptoms. Note sclerotinia and fungal growth

Stems and pods infected with white mould are pale brown and water-soaked in appearance and frequently, a white, cotton-like growth and small black bodies (sclerotia) can be seen on or within stems of diseased plants. Plants are generally killed in patches late in the growing season. Pods infected with white mould can result in seed infection. Infected seed has a loose, white, fungal growth on the seed. **Crop from infected fields should not be kept for seed** and foliar fungicides have been inconsistent. Assess your fields on a regular basis for not only diseases but insects, etc and record any changes. This information is helpful not only at harvest but in future years.

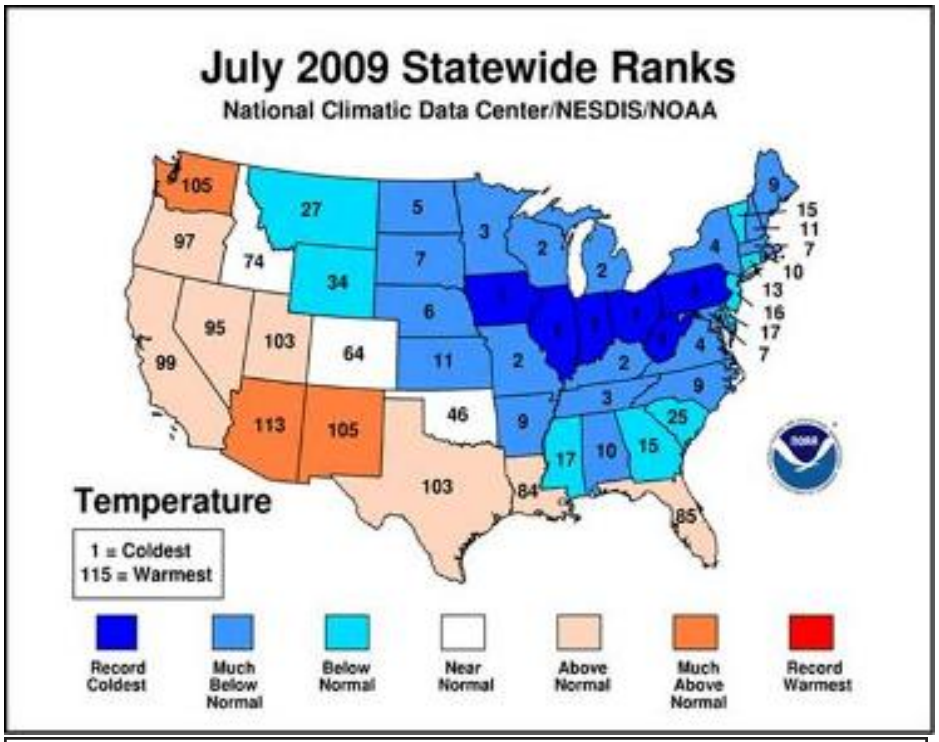

Figure 2. Ranking of July air temperatures for the continental US over the past 115 years. (source: NOAA)

Soybean Aphids and Potash Deficiency

Keith Reid, Soil Fertility Specialist, OMAFRA, Stratford

Earlier and more severe infestations of soybean aphids occur on potassium deficient soybean plants, but there is no evidence that adding potash to fields that are not deficient will help control aphids.

A University of Wisconsin study in 2004 (Scott W. Myers, Claudio Gratton, Richard P. Wolkowski, David B. Hogg, and John L. Wedberg; Journal of Economic Entomology) reported that aphids feeding on potassium deficient soybeans in the greenhouse grew faster and had more offspring than aphids on plants with adequate potassium. The reason for this increased growth was reported in a 2006 article by Abigail Walter of the University of Minnesota and Chris Difonzo of the University of Michigan, who found that the plant sap from K deficient plants had higher concentrations of the essential amino acid asparganine. Aphids with this richer food source can grow better and produce more babies.

While this finding shows that maintaining adequate potassium nutrition in the soybean is an important part of aphid management, it does not imply that potassium fertilizer is an effective aphid control. The same Wisconsin study included two years of field trials with three rates of potassium fertilizer, and found no difference in aphid infestation among the treatments. They concluded that many other factors besides potassium influence aphid distribution and survival. I have been unable to find any other reports of potassium fertilizer being used as a "treatment" for soybean aphid infestation, which leads me to believe that effective potassium management will be proactive, using soil testing to target fertilizer applications to keep K deficiency from occurring. This will not eliminate soybean aphids, but will at least reduce one of the risk factors.

Sudden Death Syndrome, Stem Canker, and Fusarium Wilt in Soybeans

Albert Tenuta, Field Crop Plant Pathologist, OMAFRA, Ridgetown

It is that time of year again when late season soybean diseases such as sudden death syndrome, stem canker, brown stem rot, fusarium wilt develop. Although these diseases do occur at other times of the season, they are most apparent when the soybean crop enters the reproductive stages of development. During this time most of the resources of the plant begin to shift from vegetative (leafs, stems, roots, etc) growth to producing and filling the pods. Due to this shift in resources, the plants natural defense mechanisms are reduced (especially under stressed conditions) thus allowing many of these later season disease causing organisms an opportunity to begin the infection process.

The following are some diseases that have begun to develop over the past few weeks. Knowing which diseases are present can help you in future variety decisions.

Figure 1. Sudden Death Syndrome symptoms

Sudden death syndrome is a good example of how the change in soybean development increases susceptibility or allows for symptom expression. Sudden Death Syndrome is a root rot disease caused by a more virulent or aggressive strain of the common soil-borne fungal pathogen Fusarium solani. Although infection often occurs during the first 6 weeks after emergence, symptoms generally do not develop or become ....cont'd

noticeable until the mid-pod reproductive stage of soybean development. Even though, the disease is most often found in field's that are infested with soybean cyst nematode, SDS can occur without SCN being present. By penetrating the root, the nematode produces openings or wounds that allow the fungus responsible for sudden death syndrome easy access to the internal root tissue. The result is increased disease. At present the most effective method to manage sudden death syndrome is the use of tolerant varieties. Check with your seed company for variety tolerance ratings.

Symptoms: Besides typical root rot symptoms, SDS infected plants will begin to show distinct yellow speckling or spotting between the veins (interveinal chlorosis). As the disease progresses these areas become larger and in severe cases the entire area between the veins becomes brown (necrotic) and dry. The leaves curl from the outer margin. These brown areas eventually disintegrate (fall out) leaving only the veins on the leaf. All through this process the veins remain green. The next symptom is often premature defoliation and death of the plant. In most cases, the petioles (leaf stalks) on these dead plants remain attached to the stem.

Cutting the root and the stem will expose a light brown or gray discolourization of the cortex tissue in the tap root and the stem. This discolourization will extend from the roots up through the stem. Although the leaf symptoms may resemble brown stem rot, in sudden death infected plants the pith (centre) of the stem remains white whereas brown stem rot infected plants have a brown and disintegrated pith.

Stem Canker may cause seedling damping off and wilt but commonly affects soybean plants after flowering. Stem canker symptoms are often described as a general yellowing of the top leaves of the plant with dark reddish-brown sunken cankers formed at the lower nodes. The lesion may extend several inches, often on one side but does not usually extend down as far as the soil line. In severe cases the lesion may cover the entire length of the stem. A cross section of the stem will reveal a slight browning at the nodes at first followed by complete disintegration of the stem in severely infected plants. The sudden wilting of the plants and the stem canker can be confused with Phytophthora root rot.

The fungus can also cause a stem or tip dieback late in the growing season. In this case, the upper four to six internodes or branches of the plant become dark brown and as the name implies the top dies. Soybean plants may become susceptible as the plants go through physiological changes due to flowering.

Figure 2. Stem canker lesion start on the node

The fungi that cause sudden death syndrome, brown stem and stem canker survive for long periods in crop debris (residue) in the soil. ***Brown stem rot*** infects early in the growing season but does not appear until a month before harvest. Stem canker prefers moderately warm, wet weather and occurs from mid-July to maturity. Plants infected with sudden death syndrome begin showing symptoms from flowering to maturity and prefer cool, moist soil conditions. Well-fertilized or vigorously growing fields are most likely to show the sudden death syndrome symptoms.

Fusarium Wilt as the name suggests causes a wilting of the soybean plant. This wilting is often misdiagnosed as Phytophthora root rot or Phytophthora wilt. From a distance the affected plants do look to have Phytophthora root rot. Affected plants have a wilting of the stem tips and the upper leaves are scorched. The middle and lower leaves can turn yellow or have pale (dull) yellow spots. In severe cases the leaves will dry up and drop prematurely leaving the petiole behind. The leaves usually remain attached to plants killed by Phytophthora root rot. There also is no evidence of a stem lesion or external decay does not go above the soil line as with Phytophthora.

A lengthwise cut through the roots and stem will reveal a browning of the vascular tissue and pith. This may be confused with early-season brown stem rot. Fusarium infested roots often have red, orange or white mycelium visible.

Fusarium wilt and root rot and Rhizoctonia root rot are most problematic when soybeans are under water and root stress. Stress can interfere with the normal activity of the plant's root system and therefore, will affect growth and potentially increase root diseases.