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Yellow Wheat – Think Virus!

Albert Tenuta, Field Crop Plant Pathologist, OMAFRA, Ridgetown

As Keith Reid (OMAFRA Soil Fertility Specialist) points out, yellowing of wheat can be caused by a number of factors including wet soils, low pH, nutrient deficiencies and of course my favourite "disease" or in this case, those pesky viruses!

Three of the most common wheat virus diseases in Ontario are ***Soilborne Mosaic Virus, Soilborne Spindle Streak Mosaic Virus and Barley Yellow Dwarf (***Table 1 on page 6) compares the three viruses.

The symptoms, life cycle and field pattern of **wheat soilborne mosaic virus (SBMV) and wheat spindle streak mosaic virus (SSMV)** are very similar. It is not uncommon to find that many plants are infected with both viruses since they share a common vector - a soilborne fungus called *Polymyxa graminis*. The fungus produces zoospores (swimming spores) which invade root hairs and epidermal cells of young plants during periods of high soil moisture or in low, wet areas of the field. The fungus can remain in the soil for at least 8 years. Temperature also plays an important role in these diseases. As the temperature increases the visual symptoms and damage decreases. Plants will recover. Yield losses range from less than 5% to 10% for wheat spindle streak mosaic to 10-40% for soilborne mosaic virus.

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Crop Emergence and Early Development

Adam Hayes, Soil Management Specialist – Field Crops, OMAFRA, Ridgetown

Crop Emergence and Crusting

The spring has been challenging in many areas of the province for those wanting to plant corn and soybeans. Cool wet soils and heavy rains have not only made it difficult to get the crop in the ground it has also affected the emergence of crops as well. It is important to check planted fields especially after a significant rainfall to ensure there are no emergence issues.

Soil crusting can be a problem on clay to loam soils. A crust can cause corn to leaf out under ground. In soybeans, a pounding rain or ponding can form a crust which can break the hypocotyl arch of the soybean preventing emergence. In both cases it may be necessary to take some action. Before taking the equipment to the field consider if another rain is forecast as that may help soften the crust. If a number of plants have emerged, do a count of the number of plants emerged, especially in soybeans where full yield potential exists (see table 2-13 in the Agronomy Guide). Remember crust busting operations can result in up to 10% loss of emerged soybeans.

Crop emergence can be aided with some light tillage from a rotary hoe, harrows, coulter cart, planter or seed drill. When setting up to perform this operation do a test strip first and check operation several times as soil moisture and soil types can change across a field. For soybeans, try to perform the tillage operation before the soybeans are at the hypocotyl stage as this is when the greatest loss will occur.

Early Crop Development

The corn plant emerges when 180 crop heat units have accumulated. Each leaf after that takes 75 crop heat units. The soybean plant will emerge in an average of 12 days although that can range from 5 to 21 days depending on variety and climatic conditions. After that it takes about 5 days on average to produce the unifoliate leaves and each trifoliate leaf after that.

Uniformity of Corn Emergence

Uniform seeding depth is a critical factor in achieving uniform emergency. Uneven emergence affects crop performance, because competition from larger, early-emerging plants reduces the yield potential of smaller, later-emerging plants. Research indicates that yields can be reduced by 5% when half the stand suffers from a 7-day delay in emergence and by 12% when half the population experiences a 2-week delay. Table 1, *Corn Yield Response to Plant Spacing and Emergency Variability*, shows the results of a University of Guelph study that examined the relative impact of emergence and in-row spacing variability on corn yield. If one of six plants (17%) had an emergence delay equal to two leaf stages (about 12 days), then overall yield reduction was 4% - 5%. If one of six plants had emergence delays equal to four leaf stages (about 21 days), then overall yield was reduced by 8%. The sizes of yield reductions associated with delayed emergence were not significantly affected by the spacing variability of the stand (doubles and misses) within the corn row.

Table 1. Corn Yield Response to Plant Spacing and Emergence Variability

Research was conducted at Elora and Woodstock (2000-01)

Plant Spacing	Emergence Delay		
	Uniform	2-leaves (1in 6)	4-leaves (1 in 6)
	% Yield [1]		
uniform	100	95	91
Double (33% of plants)	99	95	90
Triple (50% of plants)	98	94	90
Source: Lue, Tollenaar, Stewart, Deen, University of Guelph			
[1] Expressed as a percent of the uniform spacing and emergence treatment.			

Yellow Wheat Part II —Causes and Corrections

Keith Reid, Soil Fertility Specialist, OMAFRA, Stratford

A number of growers are reporting patches of yellow in their winter wheat fields. There are many potential causes for this discolouration – wet soils, low pH, nutrient deficiencies, disease – any of which may be exacerbated by backwards spring weather and slow root growth. The first step will be to diagnose the cause of the yellowing so an effective treatment can be applied. A quick guide is found in the following table.

Suspected Nutrient Deficiency	Plant Symptoms	Soil Conditions	Corroborating Tests
Nitrogen	Stunting and yellowing of entire plant, starting at lower leaves	Often associated with wet soils, where denitrification has caused N loss	Plant tissue tests (compare good with poor areas) will confirm if the yellowing is due to low N or low oxygen to roots
Magnesium	Yellowing from the base of the plant, with distinct interveinal chlorosis	Generally associated with sandy, low pH soils with low Mg. High K levels will make deficiency worse.	Soil test to confirm low Mg levels; Squirt test can give quick diagnostic
Manganese	Yellowing from the top of the plant, sometimes with faint striping of the leaves	Patterns in field often more diagnostic than leaf symptoms; appears on high pH knolls, and in hollows with muck soils	Plant tissue test (compare good with poor areas); Squirt test can give quick diagnostic
Iron	Rare in Ontario; similar to Mn, with yellowing on younger leaves first, but with more distinct interveinal striping	Saturated, high pH soils	Plant tissue test (compare good with poor areas); Squirt test can give quick diagnostic
Low pH	Stunting and poor vigour, may look like nutrient deficiency	Most often associated with sandier soils and lower slope positions (exception: Niagara, where the clays are naturally acidic)	Soil test for pH

Once the deficiency has been identified, steps can be taken to correct it. Magnesium deficiency will require soil applications of Epsom Salts or Sulphate of Potash-Magnesia (K-Mag™), or dolomitic limestone if it is associated with low soil pH. Micronutrient deficiencies can be corrected with foliar applications. The product of choice for correcting manganese deficiency is manganese sulphate, applied to provide 2 lb/ac of actual Mn (8 lb/ac of product). This should be applied in high rates of water (40 gal/ac), with a spreader-sticker to help carry the manganese through the cuticle of the leaf. Chelated manganese is much easier to use, and is more compatible with herbicides if they are mixed, but much more expensive. Scientific opinions on the effectiveness of chelates range from about 2X as effective as the sulfate (U. of G.) to equally effective (Michigan State), but the cost is roughly 10X higher for the chelate per pound of manganese. Very low rates of chelated product are not effective.

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Yellow Wheat Part II—Causes and Corrections

Keith Reid, Soil Fertility Specialist, OMAFRA, Stratford

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Squirt Test Protocol
The "squirt and see" approach can often give results quicker than the turn-around from a lab. Mix ½ teaspoon of nutrient with water in a one liter hand spray bottle, adding two drops of a spreader sticker (dish soap will work in a pinch). Lightly wet foliage with the mixture in one metre strips in the affected area(s), marking the sprayed area with flags. If the crop responds to the application within 48 hours, you have identified the problem.

Suspected Deficiency	Nutrient Source
Magnesium	Epsom Salts ($MgSO_4$)
Manganese	Manganese Sulphate
Iron*	Ferrous Sulphate

*Note: Iron is known to give plants a darker green colour, so interpret these results with caution.

New Baute Bug Blog

Tracey Baute, Field Crop Entomologist, OMAFRA, Ridgetown

Want field crop insect pest alerts and reports on infestations in real-time? Need to hear it from the horse's mouth (though I don't have nearly enough teeth) about what we are seeing or what to do about a current pest infestation? Well, you've got your wish.

Introducing….. .

BauteBUGBlog.com

Throughout the season I will keep you up to date on any insect issues we (the OMAFRA team) are observing or hearing reports about from keen ag. reps and consultants across the province or any "heads up" we receive from our friendly neighbouring states.

Once you visit the site, you can subscribe (see "Subscribe" on the right hand side of the page) to the blog so that you receive emails whenever I update the blog with new information and/or when others add their own comments on the site. And I do encourage comments about what you are seeing so that we create a network of information and communication through this site. And of course, feel free to include any general suggestions for improvements for the blog site.

This will be a learning process for all of us but hopefully it will increase the speed at which we can get insect pest alerts and recommendations out to you so that you can respond before any pest situations get out of hand.

Look forward to blogging with you!

Attention Herbicide Applicators Use Caution When Spraying in Close Proximity to Horticulture Crops

Kristen Callow and Mike Cowbrough, Weed Management Program Leads, OMAFRA

The weather this spring has been less than optimal for herbicide application. As a result, some may become anxious and spray in less than optimum conditions, for example: high or gusty wind conditions. This increases drift potential significantly.

The following table is to be used as a guide and is not inclusive of all the potential problems that could result from herbicide drift.

Use Extreme Caution When the following Herbicide Actives are Sprayed Near Sensitive Horticulture Crops – Read the Label ensuring Wind Speeds are not Conducive to Drift

Herbicide Active	Berries	Cole Crops	Lettuce	Orchards	Tomatoes	Vineyards
2,4-D, MCPA & Dicamba	++	++	+++	++	+++	+++
Glyphosate	+++	+++	+++	+++	+++	+++

Sensitivity Ratings:

+++ Highly sensitive, damage and yield loss will occur
++ Moderately sensitive, damage and yield loss likely
+ Some sensitivity, damage may occur with minimal yield loss

Note: crop stage is extremely important when determining safety. New plantings versus established plantings of berries, orchards and vineyards will vary significantly in the amount of potential damage from herbicide drift. Transplanted crops increase their tolerance substantially after the 6 true leaf stage.

What to Expect if Drift Occurs:

- The affected producer will call their regional Ministry of the Environment office, whom will do a site visit, take samples of tissue and soil, and have them analyzed for the suspect herbicides. Where appropriate, the offending applicator may face charges under the Pesticide Act.
- The affected producer will contact their insurance adjustor, and advise the applicator to contact theirs.

What to Do if Drift Occurs:

- Take photos at the time of the damage, as well as, throughout the growing season.
- Obtain spray records and weather data at the time of application.
  During harvest document yield loss. ***For perennial crops the effects of drift will need to be documented for several years.***

For further information please visit the following links:

- Ontario Pesticide Education Program http://www.opep.ca/index.cfm
- Keeping Good Spray Records http://www.omafra.gov.on.ca/english/crops/field/news/croppest/2007/02cpo07a3.htm

Yellow Wheat – Think Virus!

Albert Tenuta, Field Crop Plant Pathologist, OMAFRA, Ridgetown

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Symptoms from ***Barley Yellow Dwarf Virus*** are stunted plants that have yellowing, reddening or purpling leaf tips. BYD is often confused with spindle streak mosaic virus, soilborne mosaic virus, nutrient deficiency or environmental causes. Unlike SSMV and SBMV, Barley Yellow Dwarf is transmitted by aphids. Several species of aphids have been identified as vectors for BYD, these *include the greenbug, the corn leaf aphid, the English grain aphid and the oat birdcherry aphid.*

Table 1. Comparison of BYD , SBWMV and SSWMV

Virus	*Transmission*	*Major Symptoms*	*Additional Hosts Besides Wheat*
Barley Yellow Dwarf	Aphids	General chlorosis, reddening, purpling, stunting	Barley, oats, corn, sorghum, millet, grasses
Soilborne Wheat Mosaic	Soilborne fungus (*Polymyxa graminis*)	Yellow-green mosaic, stunting, rosetting	Rye, barley, grasses, sorghum
Wheat Spindle Streak Mosaic (Wheat Yellow Mosaic)	Soilborne fungus (*Polymyxa graminis*)	Green-yellow mosaic, streaks, spindles	Rye, barley

BYD is usually found in patches 1 to 2 metres in diameter but can occur uniformly throughout the field if aphid populations are also uniform throughout the field. Yield losses are very dependent on when the crop was infected. Generally, losses are greater when infection occurs in the fall (>30%) rather than the spring.

Identifying viral pathogens is very difficult and require accurate serological tests. Best to send samples to a diagnostic lab such as the University of Guelph's Pest Diagnostic Clinic in Guelph which have such capabilities. Some of the serological tests that are available at the Pest Diagnostic Clinic include Barley Yellow Dwarf Virus (BYDV), Soil-Borne Wheat Mosaic Virus (SBWMV), Wheat Spindle Streak Mosaic Virus (WSSMV), Wheat Streak Mosaic Virus (WSMV) and many others. They can test for one virus or screen for a group of viruses. Sample turnaround time varies between 24 hrs and two weeks depending on the viruses you wish to test for. The cost varies with the number of viruses tested and the number of samples submitted. For more information, call the Pest Diagnostic Clinic at 519-767-6256 to receive a sample submission form and fee schedule.

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