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MU Plant Diagnostic Clinic: Woes of Wheat and Forage, 2016

by Patricia K. Hosack and Lee Miller

Corn and soybean are most often submitted to the Plant Diagnostic Clinic, but occasionally we also receive wheat and forage crops. In 2016, 18 samples of wheat, 5 samples of alfalfa and 4 samples of fescue were processed through the lab.

Wheat samples included foliar diseases that are routinely diagnosed, including bacterial leaf streak, Septoria leaf blotch and rust diseases. Rust diseases were quite notable and severe in 2016, with both leaf and stripe rust in abundance. Both types of rust were often observed on the same leaf (Picture 1). Differentiation of the two rust diseases is observed in pustule development, spore coloration and spore morphology. Also, in wheat, both wheat streak mosaic virus (WSMV) and barley yellow dwarf virus (BYDV) were diagnosed. The plant clinic offers a 5 virus screen that includes WSMV, BYDV, wheat spindle streak mosaic virus (WSSMV), soil-borne wheat mosaic virus (SBWMV) and cereal yellow dwarf virus (CYDV), for an additional service fee of $20. Besides foliar issues, we also diagnosed Sharp eyespot on two samples. This disease causes an elliptical lesion on the lower stem (Picture 2). Within symptomatic leaf sheath cells, right-angled mycelium is observed indicative of the fungal pathogen Rhizoctonia cerealis.

An alfalfa sample won the 'disease of the year award', with the criteria being impressive field symptoms and distinct pathogen signs. In the fall, a sample was mailed in with violet root rot. This disease is caused by the soil-borne fungus Helicobasidium purpureum (syn. Rhizoctonia crocorum). As the species name implies, the roots and crown of the plant are covered with dark purple mycelium (Picture 3). Field symptoms were striking - large patches with dead or dying plants around the margin and disease resistant fescue growing in the center (Picture 4). Also diagnosed from two alfalfa samples was summer black stem and leaf spot caused by the fungal pathogen,

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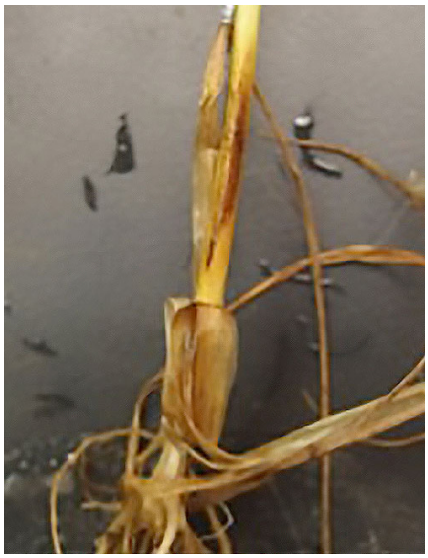
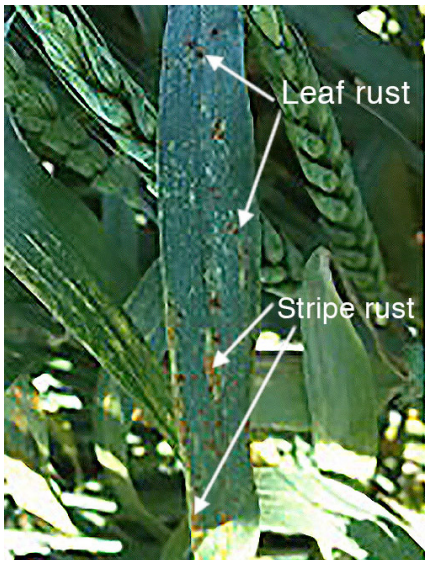


Picture 1: Wheat leaf with both leaf and stripe rust. Leaf rust is darker in color and the pustules are scattered on the leaf. Stripe rust is more yellow and the pustules are in stripes. Picture by Patti Hosack.



Picture 2: Sharp eyespot lesion on a sample of wheat. Picture by Patti Hosack.

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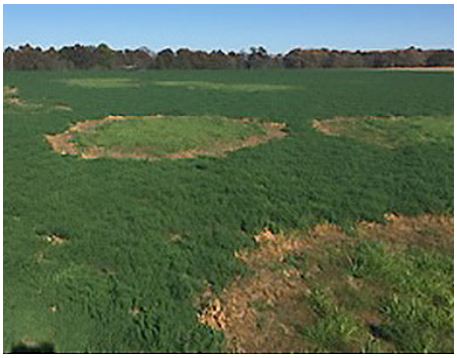
Cercospora medicaginis. This disease causes black spots (lesions) on leaves, leaf chlorosis, defoliation and black stem lesions (Picture 5). Copious amounts of pathogen spores are observed within the lesions and allow for identification (Picture 6). Abundant summer rainfall and high humidity in July and August spurred on black stem and leaf spot. Insect damage to alfalfa foliage, most caused by potato leafhoppers, was also observed on two samples.

Forage fescue wraps up the miscellaneous agronomic crops. The only disease diagnosed was common leaf rust caused by Puccinia spp.

Picture 3: A sample of alfalfa with violet root rot, note the dark purple mycelium covering the tap roots. Picture by Patti Hosack.



Picture 4: Field symptoms of violet root rot include large patches with dead plants at the margins. Often a disease resistant grass species (such as fescue) grows in the voids. Picture by Wyatt Miller.

Picture 5: Alfalfa with summer black stem and leaf spot. Symptoms include black spots on leaves, chlorotic leaves and defoliation. Picture by Patti Hosack.

Picture 6: Cercospora medicaginis spores observed in the black lesions on leaves and stems of alfalfa, diagnostic of summer black stem and leaf spot. Picture by Patti Hosack.

MU Plant Diagnostic Clinic: The Soybean Sorrows of 2016

by Patricia K. Hosack and Lee Miller

Soybeans made up 73 of the 168 field crops submitted to the diagnostic clinic in 2016, the most of any single crop. Overall, 2016 weather was quite unusual. A mild winter and early start to spring was followed by a cool May and hot, dry June. Heavy rainfall events in July brought drought relief to many Missouri regions, but late July/August flooding for some. Environmental disorders, such as lack of or too much water, and turbulent environmental conditions predisposed soybeans to a variety of diseases.

Early in the season, both seedlings and young plants were submitted with damping off or root rots. Species of Pythium are the typical causal agents of these types of disease, and are often associated with low lying areas prone to flooding or prolonged soil saturation. Symptoms include root and/or crown rot, foliar discoloration, similar to nutrient deficiency, stunting, or foliar necrosis (Picture 1). Pythium is identified by the oospores made in rotted tissues (Picture 2). Besides Pythium, other soilborne fungal pathogens can be cause the same type of symptoms. These include species of Rhizoctonia, Fusarium, and Phytophthora. Diagnosis of the causal agent can be helpful in determining management recommendations, such as crop rotation or seed treatments. Also awareness is raised to other potential issues that can correlate with early season root rots, such as stalk rots or vascular wilts. Species of Pythium are able to move from the roots into the stalk and cause crown and/or stalk rots later in the season. While species of Fusarium can be associated with minor root rots, then later develop into vascular wilts.

The hot, dry June decreased plant vigor through both heat and drought stress, and increased soybean susceptibility to charcoal rot. Other than abiotic issues such as drought stress or chemical injury, charcoal rot was the most often diagnosed problem on soybean in 2016. Charcoal rot is caused by the fungal pathogen, Macrophomina phaseolina, and typically shows up at flowering. Symptoms of charcoal rot include small leaflets, chlorotic new growth, mid-day wilting and often a light silvery-gray discoloration on the lower stems and taproot. The diagnostic sign is microsclerotia in the roots and lower stem cortex and pith tissues (Picture 3). The fungus survives as these microsclerotia on crop residue, and has a broad host range. As mentioned earlier, plant health and the environmental precursor of a hot, dry June were crucial to the prevalence of charcoal rot in 2016.

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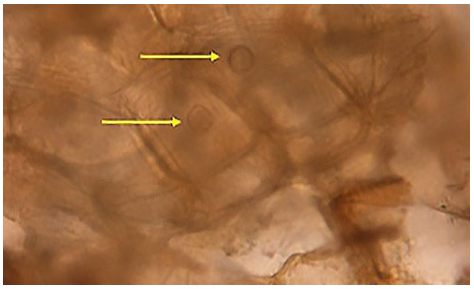
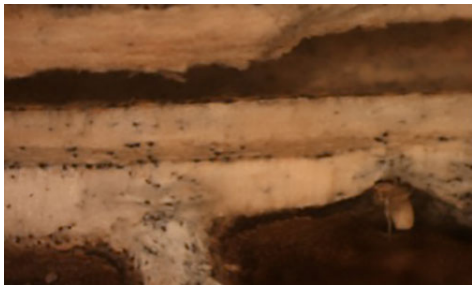
Picture 1: Soybean seedlings with rot at the necks. Damping off initiates at the soil line, sometimes plants push upward before symptoms of rot are apparent. Picture by Patti Hosack.



Picture 2: Pythium oospores observed in symptomatic root tissues. Picture by Patti Hosack.



Picture 3: Lower stem tissues with microsclerotia, indicative of charcoal rot. Picture by Patti Hosack.

Picture 4: Plants showing symptoms of Phytophthora stem rot. Picture by Patti Hosack.

Picture 5: Stem lesion caused by Phytophthora stem rot. Picture by Patti Hosack.

Phytophthora stem rot was the second most common disease diagnosed. Phytophthora species prefer wet conditions, and when soils are saturated produce a motile spore (zoospore) to spread from plant to plant. The disease was severe in July and August, particularly in areas prone to flooding or prolonged soil saturation. Symptoms of this disease are stunted, chlorotic plants and in severe cases, plant death (Picture 4). Stem lesions can be observed girdling stems and often blighting entire stems (Picture 5). Lesions are not superficial to the surface but cause discoloration (dry rot) through the cortex tissues. The MU plant clinic confirms Phytophthora presence by culture plating or serological testing.

MU Plant Diagnostic Clinic: What popped corn in 2016 *by Patricia K. Hosack and Lee Miller*

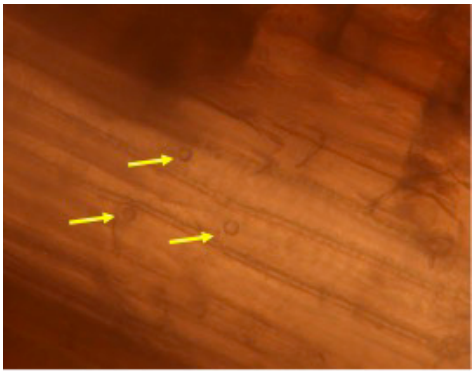
Corn made up 65 of the 168 total field crop plant samples submitted to the MU Plant Clinic in 2016, only second to soybean. The incidence and severity of diseases and disorders followed the wild swings in weather pattern. With the mild winter and early spring heat, many farmers started planting early. It was a great start, until the cool May weather slowed plant vigor and promoted disease development. Samples of seedlings and young plants were submitted with symptoms of damping-off and/or early season root rots. Typical pathogens involved in these diseases include species of Pythium, Rhizoctonia and Fusarium. Symptoms include stunting, foliar tip necrosis or nutrient deficiency type symptoms (Picture 1).

Picture 1: A sample of young corn plants showing symptoms of stunting, foliar discoloration and tip dieback. The 'bad' plants were diagnosed with Pythium root rot. Picture taken by Patti Hosack.

Damping off causes a rot at the soil line. While root rots will cause symptomatic roots to include dark lesions, root pruning and rot of the cortex tissues (Picture 2). For diagnosis, washed roots are observed under the microscope to examine for pathogen structures used to determine the causal agent(s) (Picture 3). Early season root rots do not always kill plants, but can impact plant health throughout the season and ultimately affect yield. Additionally, these soilborne pathogens can move from the roots into the stem and cause stalk rots. Correlated with the abundance of early season root rots, a fair number of stalk roots were diagnosed later in the season.


Picture 2: Corn roots with Pythium root rot, the dark discoloration and pruned roots are indicative of root rot. Picture taken by Patti Hosack.

From May we had a hot, dry June. For many the thoughts of drought loomed large, as drought-type stress symptoms were common. During this time, symptoms started showing up in fields that had been fallow in 2015. Plants were stunted and expressed symptoms of nutrient deficiency. Fallow corn syndrome is a disorder that causes low vigor plants due to poor soil microbial communities. More information can be found on this issue in the June 7, 2016 IPCM newsletter (Stunted Corn Following Prevented Planting-Fallow Syndrome).


Picture 3: Pythium oospores observed in symptomatic root tissues. Picture taken by Patti Hosack.

After a scorching June, the skies opened up over a lot of Missouri. High amounts of rainfall were reported over the 4th of July holiday. For some regions the rain continued off and on into August. High humidity caused an abundance of foliar diseases to start popping in July. Common, but not always problematic, foliar diseases such as anthracnose, Diplodia leaf streak, gray leaf spot and rust were diagnosed repeatedly. Both common and southern rust were prevalent around the state.

A new, to the USA, foliar disease of corn was announced in August of 2016. Bacterial leaf streak caused by Xanthomonas vasicola pv. vasculorum was confirmed by the USDA-APHIS-PPQ in July 2016 from corn samples originating in Nebraska. Following confirmation the USDA surveyed the Corn Belt and confirmed it in 9 other states. USDA inspectors along with MU Extension Agronomists inspected over 200 fields in Missouri and the disease was not found. However, it is probable that the

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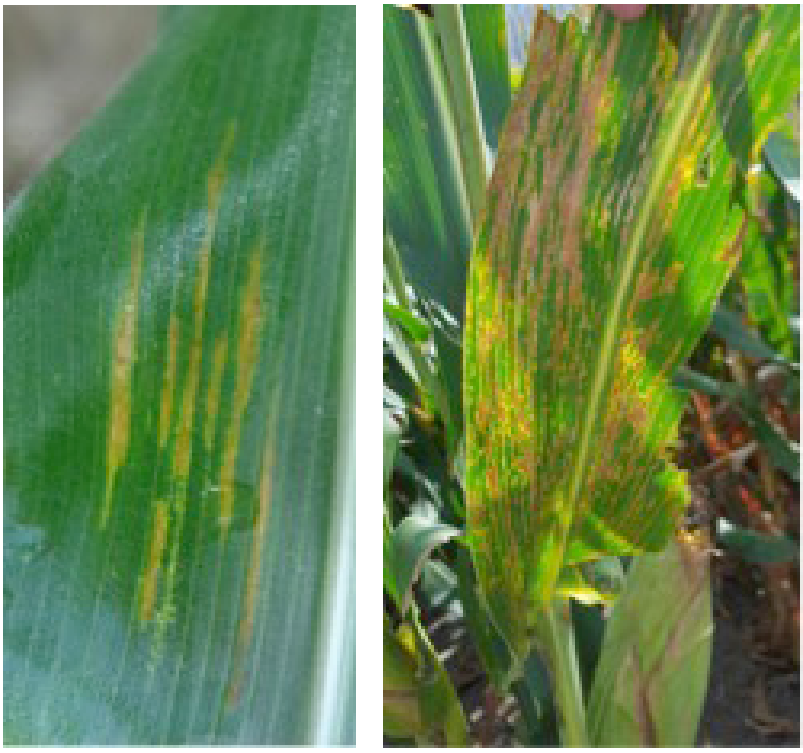
disease could be found in 2017. The bacterial pathogen survives in crop debris and is most problematic in irrigated, corn on corn fields. Keep an eye out for this disease, the main symptom to look for are interveinal streaks on the leaves. Streaks (lesions) can be yellow, orange or brown in color; these can be very long and coalesce. Lesions can look similar to gray leaf spot, however, they tend to have wavy margins (Picture 4). Foliar fungicides will not prevent this disease. There is no evidence that the bacteria moves systemically or carries over in seed. Diagnosis of this disease can be made at the Plant Diagnostic Clinic. A sample should include several (2-5) symptomatic leaves, wrapped in newspaper and mailed in a crushproof box.

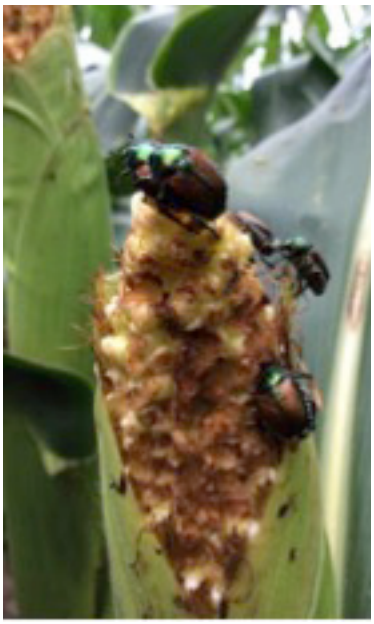


Picture 4: Symptoms of bacterial leaf streak of corn. The picture on the left shows developing lesions and the picture on the right shows developed lesions. Picture taken by Tamra Jackson-Ziems, Nebraska Extension Plant Pathologist.

Ear rots were also popping by the end of the season. In the clinic we saw quite a bit of Diplodia, Penicillium, Trichoderma and other types of Fungi on symptomatic ears. Another attester to the wet weather, were examples of seeds sprouting in the husks (Picture 5).

Picture 5: An ear of white, sweet corn with sprouted seeds. Note the growing leaves and roots had started to wrap around the ear as they could not escape the husks.

Besides diseases and environmental related disorders, there were also numerous insect issues. Japanese beetles were problematic (Picture 6) and there were numerous incidences of spider mites, thrips or rootworm damage.



Picture 6: Japanese beetles feeding on exposed corn ears. Picture by Jill Scheidt.

A list of confirmed diseases diagnosed from corn samples:

- Anthracnose leaf blight / stalk rot (Colletotrichum graminicola)
- Black head mold (Cladosporium spp.)
- Common leaf rust (Puccinia sorghi)
- Damping off (Pythium, Rhizoctonia and various other fungi)
- Gray leaf spot (Cercospora zeae-maydis)
- Diplodia ear rot / leaf streak / stalk rot (Stenocarpella spp.)
- Leaf blight (Pantoea ananatis)
- Penicillium ear rot
- Pythium root and/or stalk rot
- Rhizoctonia root rot
- Southern rust (Puccinia polysora)
- Insect issues: thrips, stalk borers, root damage, etc.