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Corn and soybean diseases 2012: A drought year in review

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Introduction

Disease development is dependent on three factors: the presence of a suitable host, a source of disease-causing inoculum, and favorable weather conditions so that the disease can develop. Together, these factors are called the plant-disease triangle, and all three "corners" of the triangle are required for disease to become a problem in corn and soybean. If any of the factors are missing or inadequate, disease has trouble becoming established. As anyone who raised crops in 2012 was aware, there was a definite shortage of water for many parts of Iowa and elsewhere, coupled with very hot weather. This weather produced an environment that was not only not conducive to crop growth, but also detrimental to disease development. Moisture plays a large part in the ability of a disease-causing agent to infect and grow.

However, despite the disease (and yield)-suppressing weather, there were disease issues in Iowa in 2012. Some diseases, such as soybean cyst nematode and charcoal rot, can actually injure crops more during hot and dry seasons. Soybean vein necrosis, a new disease in Iowa, was also reported. The most prevalent concern in corn was aflatoxin contamination associated with Aspergillus ear rot. An outbreak of Southern rust in central Iowa required that some farmer's spray a fungicide.

Early season

Frogeye leaf spot, Cercospora leaf blight, and brown spot were reported on seedlings. A few very early planted fields in northern Iowa were reported to have damping off. A dry harvest in 2011 may have contributed to lower seed quality than normal in 2012, which predisposes plants to infection by disease.

Several reports of losses in corn stand due to seedling disease were reported from eastern and southeastern Iowa. Most of the seedling disease issues that were reported were from fields that were planted April 23 to 27, just before we had a period of cold wet conditions and soil temperatures dipped back down below 50 F. Samples received by the Iowa State University Plant Disease and Insect Clinic and Robertson Lab were plated. At that point in the season, the pathogen causing seedling disease appeared to be *Pythium* spp. Further discussion of the seedling blight epidemic can be found in "Research update on seedling diseases of corn and soybean caused by oomycete pathogens" in this proceedings.

There are numerous species of *Pythium* that can affect corn, and many of these species also cause disease on soybean. Research from Ohio State University found a significant variation in sensitivity to commonly used seed treatment fungicides within and amongst species. Thus, a seed treatment might provide adequate protection against seedling disease in one field, but may not be sufficient in another field.

Mid-season

Near the end of June, many farmers and agronomists across Iowa were starting to ask if or when to apply fungicide on soybeans. With the price of soybean and fields being sprayed for spider mites or Japanese beetles, questions around "throwing in a fungicide" have been coming in. Like the past few years, there have been very little early season foliar problems. By the end of June, brown spot was really the only foliar disease still being reported, although soybeans usually grow out of any early season brown spot infection. There were also a few fields with Cercospora leaf blight.

Southern rust was reported in several fields in Butler and Grundy counties near the beginning of July. Leaf samples were received by the ISU Plant Disease and Insect Clinic, and confirmations were made. Because common rust was widespread in cornfields in Iowa, it was important for farmers and agronomists to correctly distinguish between

these two rusts, especially if a fungicide decision was to be made.

Southern rust can develop rapidly under favor able, and foliar fungicides are often required to protect yield. The earlier during the grain fill period that southern rust occurs, the greater the impact it can have on yield. Although we see southern rust in Iowa in most growing seasons, it is usually only reported in mid- to late August as the crop nears maturity. This outbreak of southern rust in central Iowa was unusually early, grain fill had just started, and, therefore, the outbreak was of concern. Furthermore, weather conditions in central Iowa near mid-July were very conducive to disease development. Several farmers in this area applied fungicide to manage the disease outbreak.

Goss's leaf blight symptoms were observed in our foliar product efficacy trials in southwest Iowa and central Iowa. And Goss's leaf blight on drought-stressed corn was reported in northeast Iowa. The ISU Plant and Insect Diagnostic Clinic also received several leaf samples with Goss's leaf blight. All reports of Goss's wilt occurred on fields with a history of the disease in 2011 that had been planted to a Goss's-susceptible hybrid in 2012.

Late season

Near the end of August, yellow patches were observed developing in soybean fields across Iowa. These patches were caused by several different things, including spider mites and soybean cyst nematode. However, there were three additional problems that were causing these patches: sudden death syndrome, charcoal rot and top dieback.

Symptoms can be very similar among the diseases, but they can be distinguished from each other. All three can have yellowing leaves in the upper canopy. For top dieback, the yellowing occurs on the outer margins of the leaves in the top of the canopy. Top dieback has been associated with potassium deficiency, but there is no clear-cut situation that precludes disease development.

Charcoal rot had been reported in the past, but in 2012 it was showing up earlier than usual. The pathogen causing charcoal rot can survive many years in the soil. Conditions experienced in 2012 – hot and dry – are conducive for development of this disease. Interveinal yellowing of the leaves, an early symptom, can look a bit like sudden death syndrome.

To distinguish charcoal rot from sudden death syndrome, there are a couple of things that can be done. First, you can look at the lower stem for microsclerotia. These can be found in the outer or inner stem tissue. A second way to tell the diseases apart is to wait until imminent death occurs. Plants with sudden death syndrome drop leaves but the petioles remain attached to the stem. Charcoal rot-infected plants that die may have leaves attached to the plants.

There were no management strategies available near the end of the season for all three diseases. But knowing what caused the spots may affect management in future years. For example, if you had top dieback in 2012, you may consider checking soil for potassium levels or soybean cyst nematode. Management of SCN or applications of potassium may alleviate this problem. Selecting resistant cultivars will help with sudden death syndrome. Finding ways to alleviate stress to future soybean crops can reduce charcoal rot.

In mid- to late August, there were several reports of aflatoxin detected in southern Iowa and also a few reports from central Iowa. At this time, levels of aflatoxin ranged from 8 ppb to almost 200 ppb. The FDA action level for aflatoxin in grain is 20 ppb. In the corn fungicide trials conducted around the state, the incidence and severity of Aspergillus ear rot was very low. Grain samples from those trials will be analyzed for aflatoxin during the winter. By the end of the season it was apparent that aflatoxin was not as widespread as had first been predicted. Elevators in western and eastern Iowa reported receiving loads of grain testing positive for aflatoxin from scattered fields in the region.

Conclusion

Despite the drought conditions experienced in 2012, there were still some disease issues in corn and soybean. Many diseases were suppressed and were not a problem, which is at least a little bit of relief for farmers and agribusiness who were otherwise hurt by the weather conditions. Disease histories of each field should be recorded and taken into account as we prepare for next year disease history will affect the risk of disease in future years, plus the lessons learned and observations made will help to make us better farmers and agronomists.