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Gary P. Munkvold
Iowa State University, munkvold@iastate.edu

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OCCURRENCE AND IMPACT OF CORN DISEASES IN 1999

Gary P. Munkvold, Associate Professor and Extension Plant Pathologist
Iowa State University Dept. of Plant Pathology

This year brought us a few surprising and a few not-so-surprising disease episodes. We have had two consecutive years of very mild winters, which is nice in January, but it can come back to haunt us in May. Although the endemic pathogens of this part of the country are adapted to cold winters, survival of some of them can be enhanced by mild winter weather. Some pathogens that are more sensitive to cold may not be much of a problem here, but they can become a problem if weather is consistently mild. This year it was evident that the mild winters have contributed to increases in disease in both corn and soybeans. In corn, the disease affected most by this is Stewart’s wilt, but others may be affected, too.

Disease severity is always linked to weather, and the 1999 weather in general was similar to 1998—a wet spring and a hot, dry summer. These conditions favor a fairly predictable group of diseases. Of course weather varied a great deal across the state and each field has its own circumstances.

Significant disease problems in 1999 included:

1. Seedling blight
2. Stewart’s wilt
3. Rugs
4. Gray leaf spot
5. Stalk rots

Early-Season Diseases

Rain was frequent if not excessive for most of the state in April. Corn planting had a late start but caught up quickly, as 52% of the acreage was planted during the week of May 2 to May 9. Many fields planted during or before this time had less than ideal soil conditions, and seedling diseases took their toll. Iowa Agricultural Statistics reported that 6% of the corn acreage had to be replanted. This amounts to about 720,000 acres and a cost of about $41 million including an estimated 5% yield reduction due to delayed planting (at $1.50/bu). If we attribute half of the replanting to seedling diseases, these diseases cost Iowa farmers about $20 million in 1999, not including the seed-treatment portion of the original seed costs. Planting into wet soil also contributed to problems with plant development and disease later in the season. Because seedling pathogens are widespread, mostly not host-specific, and greatly affected by spring weather, this year’s problems do not provide any insight into what will happen next year.

Flea beetle populations were probably at all-time highs in Iowa in 1999. In southern Iowa, insecticide applications for flea beetle control were common, especially in seed production fields. Flea beetles carry the bacterium that causes Stewart’s disease (Stewart’s wilt), and they transmit the disease from plant to plant. Because of the high beetle populations, Stewart’s disease was very common in southern Iowa. Early in the season, severe flea beetle infestations can result
in uniform infection, sometimes causing wilting and death of plants, especially in inbreds. But the impact of Stewart’s wilt on hybrid corn is difficult to judge, because most of the injury to the plant is late-season leaf death. It is clear that the disease started early enough in some fields to cause yield loss. If we conservatively estimate that 2.5% of the corn acreage had severe enough disease to affect yield, and the yield impact was about 5%, that represents a loss of about 2 million bu of grain. It is likely that the acreage affected was greater than 2.5%, but precise estimates are not possible. Prospects for reducing these losses in years of outbreaks are not good, because the cost of full-season flea beetle control is prohibitive. Better possibilities exist for seed corn through the use of new systemic insecticidal seed treatments. The bacterium (*Pantoea stewartii*) that causes this disease overwinters in the flea beetle adults. It is likely that a large population is overwintering this year, so if the winter is mild again, expect a lot of Stewart’s disease.

**Mid- and Late-Season Diseases**

Once the corn recovered from the spring moisture, disease problems were not very prevalent until after pollination. One notable exception was eyespot, caused by *Aureobasidium zeae*. This disease was very severe in a few fields, particularly where there was a lot of moisture in June and corn was following corn.

Leaf diseases on corn accelerated very rapidly in August. The most widespread problem was southern rust, caused by *Puccinia polysora*. This disease occurs each year in Iowa, but it has never been as widespread and severe as it was in 1999 (C.A. Martinson, personal communication). In many cases, it occurred together with common rust (*Puccinia sorghi*). These diseases can be distinguished by several features:

1. Pustule size and color. Southern rust pustules are smaller and lighter in color.
2. Pustule distribution. Southern rust pustules are mostly on the upper surface, but common rust is almost always on both surfaces.
3. Leaf necrosis. Common rust will cause necrotic spots on the leaves. Southern rust does not tend to do this, but leaves with numerous pustules will dry up completely.
4. Telia. Late in the season, the pustules turn into telia, which are made up of dark brown or black spore masses. In southern rust, they are tiny and remain underneath the leaf epidermis. In common rust, they are larger and break through the epidermis.

Both rusts became common late in the season, but southern rust predominated. This problem was distributed across the state, but the worst outbreaks seemed to be in west-central Iowa. Northeast Iowa, on the other hand, seemed to have the least problem with rust, in spite of the excessive rain they received during the summer. Why was southern rust so prevalent in 1999? The answer lies in the July weather. It was the 16th warmest July on record (in 127 years), the hottest month since August 1983, and the first July with temperatures above the long-term average since 1989. Even more important, the dew point was consistently very high in July, which means it was very humid and dews lasted a long time on the corn leaves. Dew points were above 80 F for nearly two weeks in some parts of the state. At a dew point of 80, the amount of moisture in the air is twice as much as at the normal dew point for July (63 F). Rusts do not overwinter in Iowa, as far
as we know, so there are no precautions necessary for next year. Some have suggested that the mild winter may have allowed for overwintering of rusts, but we have no evidence for that.

In many fields the leaf disease problems included Stewart’s disease and gray leaf spot (Cercospora zeae-maydis) as well as rusts. Gray leaf spot was severe in many fields, but did not reach the epidemic proportions of 1994 or 1995. This disease has reached a point in Iowa where each year, there are some fields with significant problems, but gray leaf spot can be managed with currently available tactics. Gray leaf spot continues to increase its range. In 1999, it reached damaging levels in fields as far to the Northwest as Woodbury Co., and it can be found in any county in the state. Losses to leaf diseases in 1999 may have reached 30 bu/acre in some fields, mostly due to southern rust, but usually in combination with Stewart’s disease or gray leaf spot. Gray leaf spot management options continue to improve, with better hybrids available and two new fungicides, Quadris (Zeneca) and Stratego (Novartis) coming along soon. Both seem to be superior to Tilt for gray leaf spot and rusts. Gray leaf spot will overwinter in crop residue, so crop rotation is important, especially in conservation tillage.

**Premature Plant Death**

Many fields with leaf disease problems also suffered from premature plant death. Usually, when plants die prematurely it is due to a combination of factors including environmental stresses and plant pathogens. This year was a favorable year for stalk rot because the spring was wet, resulting in shallow, poorly developed root systems frequently with minor or major infections by root rotting fungi such as *Fusarium* and *Pythium*. During grain-fill, we had high temperatures and low rainfall (with some notable exceptions). This combination causes the leaves to demand more moisture form the roots, which are not in good condition. The result is moisture stress on the plant and increased stalk rot susceptibility. Premature plant death due to moisture stress, root and stalk rot, and leaf diseases was widespread. Corn belt hybrids should go 55-60 days from silking to black layer, and if they black layer sooner than this, they have suffered yield loss. When plants die prematurely, a rule of thumb is that there will be 1% yield loss per day if the plants die 1-5 days prematurely, and 2% per day for death 6 or more days prematurely. This translates into 8-10% yield loss for 1-week premature death, and 20-25% yield loss for 2 weeks premature death. According to the September 17 crop report, the pace of corn maturity was about 11 days ahead of normal. Since the average silking date was about normal, this means that the crop matured about 1-2 weeks premature on average. This means we lost about 15% of our crop to premature plant death, due to a combination of moisture stress, rootworm damage, root rot, leaf diseases, and stalk rot.

**But my yields were pretty good!**

Today’s hybrids can yield remarkably well under stress. We have seen from yield contests that modern hybrids can yield more than 300 bu/acre with high fertility, good weather, and minimal weed, insect, and disease occurrence. Some fields that died a week or more prematurely still yielded 180 bu/acre or more – these fields suffered yield loss and could have had greater than 200 bu yields if they had continued to fill grain for the entire 55-60 days after pollination.

Stalk rot pathogens are perennielly present in our fields, and tillage usually does not contribute to their control, unless there is an underlying problem caused by gray leaf spot or eyespot. Crop
rotation helps, as does controlling other plant stresses like insect damage and poor fertility (especially Potassium). Fields that suffered from premature death should be carefully evaluated for possible contributing factors that can be handled through hybrid selection, crop rotation, insect control, or residue management. Each field is different, so recommendations will vary.