Plant Pathology
COLLEGE OF AGRICULTURAL & LIFE SCIENCES
UNIVERSITY OF WISCONSIN–MADISON

History Note No. 2

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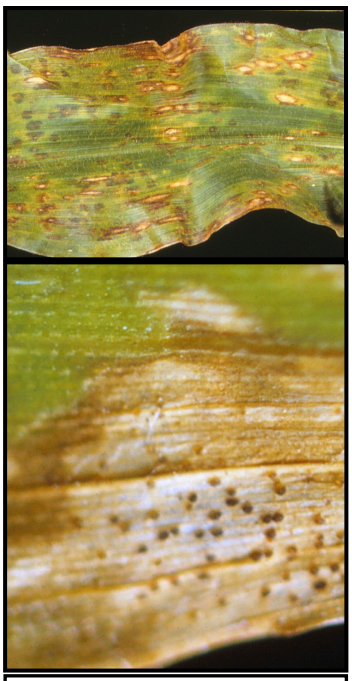
Texas male-sterile cytoplasm Corn: Yellow Leaf Blight

Before the 1920's, the corn planted was open-pollinated seed, but during the 1920's, hybrid corn varieties were introduced. By the end of 1930's, 100% of cultivated corn in the corn belt was hybrid corn, which involved crosses between two or more inbreds. This required the removal of tassels on one parent. Cytoplamic male sterility (cms-T), also called Texas male-sterile cytoplasm (T-cms), was introduced into production of hybrid seed corn as this trait eliminated the need to detassel one inbred. By the 1960's, the major of corn being planted in the corn belt was produced using cms-T inbreds. This resulted in genetic uniformity for one of USA's important crops.

Gayle L. Worf, 1970

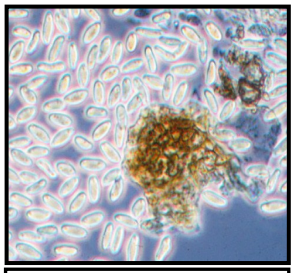
The following narrative is from Professor Gayle Worf (faculty member from 1963-1992). It started innocently and routinely enough with a call from Gavin Weiss, the Hancock Station Superintendent, in the fall of 1967. It seems that a seed producer nearby was experiencing unusual symptoms on his corn. So when I was up that way, we took a look. I knew that I hadn't encountered this situation before. I took samples back to Russell Labs, made isolations, and during the winter determined it was caused by a *Phyllosticta species*. *Phyllosticta* was listed in the USDA host index way back in 1931. My suspicion was that it was not the same pathogen. The next spring was a cool wet one, ideal for yellow leaf blight, which we called the disease. Suddenly farmers, who had been continuously cropped corn, especially in lower areas, were experiencing problems. Seed producers throughout the state were experiencing even greater difficulties. In walking their crossing fields, it became apparent that the female plants (with Texas male sterile cytoplasm, cms-T) were badly blighted while the male counterparts were little affected. Professor Deane Arny, who had recently returned from Nigeria, and I planted at Hancock Experiment Station otherwise genetically identical inbreds except one inbred was male sterile (cms-T) and the other inbred was non-cms-T. The results showed that those inbreds with cms-T were susceptible and those without cms-T were resistant. This observation in Wisconsin was the first to show what was about to hit the corn belt, i.e., Southern corn leaf blight (SCLB) caused by a new race of *Cochliobolus heterostrophus* Race T. Because of the susceptibility of Texas male-sterile cytoplasm hybrids, SCLB would devastate the national corn crop in 1970. Losses were over $8 billion in 2025 dollars, about a 16% yield reduction.

Deane C. Arny, 1970, Tms inbred on the left.



Top photo: typical symptoms of yellow leaf blight.

Bottom photo: Lesion with pycnidia.



Pycnidium and spores of *Phyllosticta maydis Arny & Nelson.*

We were able to determine the cause and relationship rather quickly because of cooperation and openness of some members of the seed trade. Not all members of the seed trade were quite as amiable. I recall a meeting held for the seed producers in the fall of

1968, where I presented these findings and suggested that the trade return to the use of normal cytoplasm for seed to be sown on vulnerable sites. A big burly fellow in the back of the room stood up and really lit in to me, "Young man, do you know what you are saying?" I later learned his name was Clyde Black; he was from Iowa; and the chief distributor of inbred seeds for the trade. Luckily, for me"!" the next year, SCLB came along and devastated corn throughout the corn belt - and saved my hide!

This story indicates the need for good strong training in traditional plant pathology and maintaining its skills and basic principles, along with equally strong ties to basic agricultural practices so that problems can be recognized and resolved quickly. Futhermore, it points out the vulnerability of genetic monoculture, which will never go away.

Sources:

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Photos from the slide collection of D. C. Arny and G. L. Worf

Prepared by Professor Gayle Worf in 2020 and edited by Douglas Maxwell and Craig Grau in 2025.