A step toward control of bean pod mottle virus: Identifying field tolerance

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Abstract
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Keywords
Plant Pathology

Disciplines
Agricultural Science | Agriculture | Plant Pathology

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Plant Diseases

A step toward control of bean pod mottle virus: Identifying field tolerance

by John H. Hill, Department of Plant Pathology, Iowa State University; and Craig Grau, Department of Plant Pathology, University of Wisconsin

So, have you been wondering what to do about all those soybean plants that have mottled leaves? Populations of bean leaf beetles, the insect that efficiently transmits bean pod mottle virus, have been very high. The last issue of the ICM newsletter told you to expect potential yield reductions this fall and reduced seed quality evidenced by seeds that are stained (hilum bleeding). But there may be some soybean cultivars/accessions that are not so bad. We have known for some time that soybean cultivars can vary significantly in response to disease caused by the virus. However, leaf symptom severity does not correlate well with damage caused by the disease and seed staining does not correlate positively with amount of virus in the seed. Further, several reports have tested close to 200 accessions, ancestral lines, varieties, etc. in efforts to find resistance. So far, none has been found. Therefore, in a cooperative program funded by the North Central Soybean Research Program, Iowa Soybean Association, and Wisconsin Soybean Marketing Board, researchers at Iowa State and the University of Wisconsin decided to take a different approach—can field tolerance be identified? Not only does it need to be identified, but it needs to be quantified; i.e., what kind of number will demonstrate that variety A is better than variety B, and by how much? Although the plant is not immune to the disease, field tolerance allows the plant to produce reasonable yield as well as decent seed quality in the presence of virus disease.

Although many parameters were measured, a quantitative assay of the amount of virus contained in the seed harvested from experimental plots (relative seed antigen) and percentage of seed coat mottling provided the best measure of field tolerance. These data allowed calculation of a seed index that proved useful in preliminary identification of tolerance. Thirty-three soybean accessions were evaluated for field tolerance at two Wisconsin locations over a three-year period.

Compounding identification of tolerance to bean pod mottle virus is the presence of soybean mosaic virus, whose leaf mottle symptoms and stained seeds look like those caused by bean pod mottle in the field. Soybean mosaic, efficiently transmitted by the soybean aphid and not the bean leaf beetle, has been increasingly prevalent...
since the introduction of the soybean aphid. Further, infection by both viruses can cause synergism, meaning that damage caused by both viruses in the same plant is more than additive. Therefore, it is imperative that interpretation of data to identify field tolerance to virus disease requires correct identification of viruses prevalent at the field site where the test is conducted. The technology developed for this study required that the assay could quickly and accurately differentiate between both viruses.

The good news is that three accessions showed tolerance to bean pod mottle and soybean mosaic viruses, four were tolerant to bean pod mottle, and eight were tolerant to soybean mosaic. This proof of concept study suggests that in the future field tolerance can be utilized to reduce the damage caused by these virus diseases. The method will allow the seed industry to easily mechanize evaluation of accessions to provide tolerant varieties to producers. Further, it allows for a useful estimate of virus incidence in the field. Details will be published shortly in the journal Crop Science.

John H. Hill is a professor of plant pathology with research responsibilities in virology. Craig Grau is a professor of plant pathology at the University of Wisconsin with research responsibilities in soybean diseases.

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**Plant Diseases**

**Sentinel plots at end of the season**

by Ralph von Qualen and X. B. Yang, Department of Plant Pathology

We are completing our second crop season since Asian soybean rust (ASR) was found in the United States. We can breathe a sigh of relief and give thanks that ASR did not make its way to Iowa. Indeed, this potentially devastating disease has not plagued the entire north-central United States. Had conditions been favorable for this disease, we were ready to give producers fair warning.

The United States Department of Agriculture (USDA) and the North Central Soybean Research Project (NCSRP) funded the establishment of sentinel plots in Iowa and across the midwestern and southeastern United States. Perhaps you have logged on to [www.sbrusa.net](http://www.sbrusa.net) to watch the national map that shows the results of scouted sentinel plots and locations where soybean rust has been found. This year’s warm, dry weather was not conducive to disease development. Nevertheless, rust was found on soybeans in 25 different counties in seven states: Alabama, Florida, Georgia, Louisiana, Mississippi, South Carolina, and Texas by September 8.

Rust did not come close to Iowa, but we remained vigilant because this is a new disease and we could not be certain of its progress.

Sentinel plot at Castana. Two maturity groups were planted at different times. The difference in plant height is due to different planting dates. Castana was extremely dry during June and July. The plants survived the drought but did not grow tall. (Ralph von Qualen)