

Vigor Test Helps Determine Soybean Seed Quality

FAYETTEVILLE, ARK.

Soybean producers rely on standard germination test results when selecting quality seed to plant their crops. But germination rates may not provide all the information farmers need to choose the seed that will best meet their management systems.

Seed vigor, or a seed's ability to make a stand and grow to maturity, is at least as important as germination rate, said Rick Cartwright, plant pathologist for the University of Arkansas System's Division of Agriculture. Germination rates, based on standard tests conducted under optimum germination conditions, don't tell a producer anything about the seeds' vigor.

"It became apparent that two seed samples with the same germination rating didn't necessarily start with equal vigor," Cartwright said. In addition, some seed that remains in storage for June or July planting may not emerge as well as it would if it was planted earlier.

The Arkansas Soybean Promotion Board asked the Division of Agriculture to investigate a vigor test called accelerated aging to see if it could give Arkansas producers additional reliable information about their seed options.

Accelerated aging was standardized and approved by the American Association of Official Seed Analysts and the International Seed Testing Association in the 1990s, Cartwright said. Unlike germination tests, however, vigor tests are not required by the USDA or enforced by state regulatory agencies like the Arkansas State Plant Board.

"Seed companies are likely to use seed vigor tests voluntarily," Cartwright said. "Because their reputation depends on the quality of their seed, they want to know all they can about their product."

Producers don't always have easy access to that information, Cartwright said. "But, if they know what to ask for, some companies are willing to provide it to them," he said.

The research began with a planting seed quality survey. Extension soybean agronomist Jeremy Ross said researchers collected some 440 seed samples from growers' planting stocks.

The division set up a lab at the Arkansas Agricultural Research and Extension Center in Fayetteville to conduct accelerated aging and other seed quality tests. Program associate Sandy Goeke was trained to conduct the tests.

The point of accelerated aging is to put stress on the seed before conducting a germination test, Cartwright said.

Samples are first subjected to an incubation chamber where they are maintained at 41 degrees Celsius (105.8 degrees Fahrenheit) for 72 hours. Then Goeke wraps the seeds in a special paper designed to promote germination and places them in a second incubator where they are maintained at optimum germination conditions for seven days.

Afterward, the samples are evaluated to see how many seeds germinated successfully. Samples stressed by accelerated aging are also planted in test plots to see how they perform under field conditions.

Cartwright said that germination rates for the seed collected during the survey did not decline much from April through July, even when stored before planting, but there was a definite decline in vigor as measured by the accelerated aging test.

"It's pretty important to understand seed vigor in Arkansas, where we commonly double crop soybeans behind wheat, because germination conditions may be harsh," Cartwright said.

Plant pathologist John Rupe is conducting several field tests to look at interactions of seed quality and vigor with pathogens that cause seed and seedling diseases.

Using late maturity group 4 and early maturity group 5 varieties, planted in plots in Poinsett County and at the Northeast Research and

Extension Center at Keiser, Rupe is evaluating the effects of three planting densities and two planting dates on seeds with varying germination rates and vigor results from the accelerated aging test. "We did stand counts and are looking at yield results," he said.

In another test at the Vegetable Research Station at Kibler, Rupe is evaluating practices that may improve seed production.

"If you have high germination rates and opti-



Program associate Sandy Goeke places 50 age-accelerated soybean seed samples in a wrapper of germination paper. They will then be incubated at 68 degrees Fahrenheit for 7 days. Afterward, vigor will be determined by the number of seeds that have successfully germinated.

mum planting conditions, you may get a good stand no matter what the seed vigor may be," Rupe said. "But under stressful conditions, including the presence of pathogens, stands and yields can suffer."

"What we're trying to determine," Rupe continues, "is, if you have seed with vigor problems, is there anything you can do to improve stands?"

Among the crop management practices that can be employed to help, Rupe said, are selecting seeding rates, planting dates and the use of seed treatments to ward off pathogens.

Rupe adds that division scientists are also looking at practices that can help preserve vigor during seed storage.

Ross said an important part of the seed quality program is to help farmers understand what the accelerated aging test is and how it can help them. Debby Monfort, professional assistant in plant pathology, is coordinating an education program with Ross and Cartwright.

"Germination rates are pretty stable, but vigor is sort of a moving number," Ross said. "Because the seed is a living organism, it has metabolic processes that continue even during storage. These processes may reduce vigor, especially if storage temperatures and humidity stress the seed."

Especially for late planting dates in a double cropping system, Ross said, it's important to get the stand up and the leaf canopy closed to help shade out weeds.

"If you know you have poor quality seed, especially if you expect poor growing conditions, you may want to increase the seeding rate, wait until planting conditions are closer to ideal or select a higher quality seed with good vigor," Ross said. Δ

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