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Soybean Sudden Death Syndrome Field Screening

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Abstract

Soybean sudden death syndrome (SDS) is caused by the *Fusarium virguliforme* fungus. This fungus infects and grows in the plant's roots. The fungus produces a toxin, which is transported into the leaves and causes foliar yellowing, browning, and finally early leaf drop. Root infection and toxin production are highly affected by environment and irrigation, and early planting is important to ensure a good screening test.

Disciplines

Agricultural Science | Agriculture | Agronomy and Crop Sciences | Plant Pathology

Soybean Sudden Death Syndrome Field Screening

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Introduction

Soybean sudden death syndrome (SDS) is caused by the *Fusarium virguliforme* fungus. This fungus infects and grows in the plant's roots. The fungus produces a toxin, which is transported into the leaves and causes foliar yellowing, browning, and finally early leaf drop. Root infection and toxin production are highly affected by environment and irrigation, and early planting is important to ensure a good screening test.

The Regional (SDS) Screening Project evaluates experimental soybean varieties from public (university and USDA) breeding projects. There were fifteen screening locations in six states in 2008. Many locations were in the Southern U.S. and would not accurately evaluate varieties developed for northern and central Iowa latitudes. Only six of these locations grew the Maturity group I (MG I) test—material that would yield well in northern Iowa—and only two of those locations were north of central Iowa.

This was the second year of field evaluation for MG I and II (central Iowa lines) soybean varieties at the Northern Research Farm. Varieties evaluated came from Minnesota, Illinois, and Iowa breeding programs. The Northern Research Farm, Kanawha, is an ideal location for the MG I SDS Regional Test because of its geographical location, access to irrigation, and on-farm staff to assist with irrigation and plot maintenance.

Materials and Methods

The experiment was planted on April 23, 2008. There were 21 varieties evaluated in the MG I test and 18 varieties in the MG II with three replications. Plots were sprinkler irrigated starting the first week in July and continuing through the end of July. Irrigation water and rainfall together totaled 1 in./week.

Plots were rated for disease incidence and severity on July 23, August 7, and August 24. Data from August 7 were used as the best ratings for MG I and August 24 data were used for MG II lines. Disease incidence was based on percentage of plants/plot showing symptoms. Disease severity was an average of all diseased plants in a plot. Severity scale was based on a 1–9 scale, healthy plants with a few small yellow spots rated as 1 and dead plants (no leaves, stem brown) as 9.

Results and Discussion

Disease incidence this year ranged from 0–40%, and disease severity ranged from 0–4.7 (on a scale of 0–9). To accurately select varieties with higher levels of SDS resistance, incidences of 30% or better are needed because of disease variation within the field. When the most susceptible lines have low disease ratings (< 20%), the separation of resistant and susceptible lines is difficult.

Although averages are usually taken over multiple locations and years, the entry averages suggest 1) there are many lines in the MG I that are more susceptible than the susceptible checks, 2) the resistant check, MN1606SP, did not perform well at this location, and 3) of the three lines from Iowa, AR03-163008 and AR07-176049 should be selected for further testing and possible release.

In 2007, disease incidence at Kanawha was less than 5% on all entries. This was due, we believe, to planting late (May 2). The Minnesota location for MG I varieties did not have any SDS symptoms this year.

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Table 1. SDS experiment averages and maximum line average for incidence and severity by year and location.

| Year | Location | MG I* | | MG II* | |
|------|------------|-------------------|------------------|-------------------|------------------|
| | | Average incidence | Average severity | Average incidence | Average severity |
| 2005 | Hinds/Ames | .02/2 | 3/2.7 | .1/2 | 1.7/6.3 |
| 2006 | Hinds/Ames | 3.5/12.0 | 2.1/5.0 | 5.0/10.0 | 2.9/4.7 |
| 2007 | Kanawha | .5/3.3 | .7/3.7 | .8/5.0 | .7/2.7 |
| 2008 | Hinds/Ames | - | - | 20.1/51.7 | 2.0/3.7 |
| | Kanawha | 16.7/40.0 | 3.0/4.7 | 1.9/9.7 | 1.3/3.3 |
| | Hinds/Ames | - | - | 36.3/93.3 | 3.4/5.0 |

*Total experiment average and highest line average (separated by “/”).

Table 2. 2008 Kanawha line averages in SDS test.

| Ranked entries | Source | Incidence | Severity |
|---------------------------|--------|-----------|----------|
| M97-357138 (susceptible) | Check | 16.7 | 4.3 |
| MN1606SP (resistant) | Check | 11.7 | 3.0 |
| Myc 5171 RR (susceptible) | Check | 7.3 | 3.7 |
| AR05-150079 | IA | 11.7 | 3.3 |
| AR07-176049 | IA | 0.0 | 0.0 |
| M99-337034 | MN | 26.7 | 4.0 |
| M03-917020 | MN | 25.0 | 3.0 |
| M99-333036 | MN | 8.7 | 2.7 |
| AR03-163008 | IA | 2.0 | 1.0 |
| M00-456052 | MN | 5.0 | 2.3 |
| M02-349072 | MN | 3.3 | 0.7 |
| M02-349077 | MN | 32.3 | 2.7 |
| M02-349008 | MN | 31.7 | 3.3 |
| M02-485006 | MN | 4.0 | 3.0 |
| M02-349085 | MN | 10.0 | 3.0 |
| M02-349053 | MN | 31.7 | 3.7 |
| M02-483035 | MN | 13.3 | 4.0 |
| M02-341015 | MN | 38.3 | 3.7 |
| M02-483076 | MN | 23.3 | 4.7 |
| M02-483059 | MN | 40.0 | 4.3 |
| M02-483064 | MN | 8.3 | 3.3 |
| Test Average | | 16.7 | 3.0 |
| P > F | | 0.106 | < .0001 |
| LSD (.05) | | 27.6 | 1.2 |