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Efficacy Tests of Foliar Fungicides on Soybean Diseases and Yield during 2012 and 2013 Growing Seasons in Northeast Iowa

Abstract
The foliar, stem and root diseases of soybean are significant components of yield loss for crop producers. Use of fungicides is one of the options in management of soybean diseases. Fungicide use in soybean has increased from <1 percent in 2002 to 11 percent of soybean planted acres in 2012 in 20 soybean-producing states (Arkansas, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nebraska, North Carolina, North Dakota, Ohio, South Dakota, Tennessee, Virginia and Wisconsin) (USDA-NASS). The objective of these trials was to test the efficacy of various foliar fungicides on disease control and yield during 2012 and 2013 growing seasons.

Keywords
Plant Pathology and Microbiology

Disciplines
Agricultural Science | Agriculture | Plant Pathology
Efficacy Tests of Foliar Fungicides on Soybean Diseases and Yield during 2012 and 2013 Growing Seasons in Northeast Iowa

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The foliar, stem and root diseases of soybean are significant components of yield loss for crop producers. Use of fungicides is one of the options in management of soybean diseases. Fungicide use in soybean has increased from <1 percent in 2002 to 11 percent of soybean planted acres in 2012 in 20 soybean-producing states (Arkansas, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nebraska, North Carolina, North Dakota, Ohio, South Dakota, Tennessee, Virginia and Wisconsin) (USDA-NASS). The objective of these trials was to test the efficacy of various foliar fungicides on disease control and yield during 2012 and 2013 growing seasons.

Materials and methods

Two trials were conducted in each growing season, 2012 and 2013. Trials were set up in a randomized complete block design with four replications each with 10-ft-wide (four 30-inch rows) × 45.5-ft-long plots at the Northeast Research and Demonstration Farm, Nashua, IA. Trial-1 assessed the efficacy of various fungicides for disease control and yield (Tables 1 and 2) and Trial-2 assessed the efficacy of several fungicides and application timings for control of soybean diseases during 2012 and 2013 cropping seasons (Tables 3 and 4).

Table 1. Effect of foliar fungicide application at R3 growth stage on soybean diseases, defoliation, and yield during 2012, Nashua, IA

<table>
<thead>
<tr>
<th>Product (male)</th>
<th>Application Rate</th>
<th>SNP (%)</th>
<th>WSN (%)</th>
<th>SNP (%)</th>
<th>WSN (%)</th>
<th>SNP (%)</th>
<th>WSN (%)</th>
<th>Defoliation (%)</th>
<th>Yield (Bu/Ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenox 80%</td>
<td>1.5 + 0.25%</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>12.0b</td>
<td>69.0a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trifol 95%</td>
<td>1.5 + 0.25%</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>15.0b</td>
<td>69.0a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Con 50%</td>
<td>1.5 + 0.25%</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>12.0b</td>
<td>67.0a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genetix 20%</td>
<td>1.5 + 0.25%</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>15.0b</td>
<td>68.0a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BASF 40%</td>
<td>1.5 + 0.25%</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>15.0b</td>
<td>60.0a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nufarm 40%</td>
<td>1.5 + 0.25%</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>15.0b</td>
<td>69.0a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ths 3%</td>
<td>1.5 + 0.25%</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>15.0b</td>
<td>69.0a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bz Superb 5%</td>
<td>1.5 + 0.25%</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>15.0b</td>
<td>69.0a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prelude 6%</td>
<td>1.5 + 0.25%</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>15.0b</td>
<td>69.0a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prelude 12%</td>
<td>1.5 + 0.25%</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>0.02a</td>
<td>15.0b</td>
<td>69.0a</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Means with the same letter are not significantly different (P<0.05). Values are means of four replications. Disease severity scores: 0-100; SNP = Sclerotinia nodorum blight; WSN = White snow mold; SNV = Soybean vein necrosis. Note: Application rate of Prelude was lower in this trial than in 2013.
Field operations: Trial-1 in 2012 was no-till planted with Asgrow Brand AG24-31 and in 2013 was planted in a convention tillage system (fall chisel plow, spring field cultivate) with NK Brand S20-Y2 at 188.8k PPA in 30 in. row spacing with a Kinze 3000 planter on May 17 and June 17, respectively (previous crops were corn). Trial-2 in 2012 was no-till planted with NK Brand S25-R3 (previous crop was oats) and, in 2013, no-till planted to NK Brand S25-T8 (previous crop was corn) at 188.8k PPA in 30 in. row spacing with a Kinze 3000 planter on May 20 and June 17, respectively. In all trials, fungicides were applied using CO2 backpack (10 ft hand boom/ XR8003 tips) as per the treatment details and protocols provided by the companies (Tables 1 to 4). To maintain weed free (including glyphosate-resistant water hemp) plots, pre- or post-emergence herbicides (Outlook, Zidua, Roundup WeatherMax and Fusion) were sprayed at recommended rates. To control spider mites, Lorsban insecticide (1.5 pint/Ac) was used in 2012 and in 2013 soybean aphids were controlled with Warrior II insecticide (1.96 oz/Ac). Plots were harvested using a John Deere 4420 combine with Shivvers grain moisture meter and Avery-Weigh Tronix weigh scale indicator and yields were adjusted to 13% grain moisture (Tables 1-4).

Fungicides: Four Triazole products (Domaq, Proline, Tilt and Topguard),
efficacy tests of foliar fungicides on soybean diseases and yield

three Strobilurin (Gem, Headline and Quadris) and three mixtures of active ingredients of Strobilurin and Triazole (QuiltXcel, Stratego YLD and Priaxor) were tested (Tables 1-4).

Evaluation for diseases: Pre- and post-fungicide spray diseases ratings were recorded weekly from one week before application through one week before the harvest however, only mean final percent disease severity and incidence are presented in Tables 1 to 4.

Data analysis: Data was analyzed using SAS.

Results and discussion

The following diseases were observed in Trial-1 during the 2012 growing season: bacterial leaf blight (trace), frogeye leaf spot (trace), sudden death syndrome, white mold (trace) and Soybean vein necrosis (Table 1). Soybean vein necrosis (Fig 1) is a new disease (Smith et al., 2013). There was no evidence of an effect (P<0.05) of fungicide on disease incidence and severity, but some fungicides reduced (P<0.05) defoliation compared to the unsprayed control (Table 1). Although most fungicide treatments yielded greater than the unsprayed control, no significant (P<0.05) yield differences were noted when comparing sprayed versus the unsprayed control treatment (Table 1). The mean response to fungicides was 2 bu/ac (range -3.26 to 6.32 bu/ac) advantage over unsprayed control (Table 1). In Trial-1 during 2013, white mold was observed. There was no effect of treatment on yield (P<0.05) although mean yield response across all the fungicide treatments was 2.2 bu/ac yield advantage (range 0.86 to 3.82 bu/ac) compared to the unsprayed control (Table 2).

Fig 1. Symptoms of Soybean Vein Necrosis.

Diseases observed in Trial-2 during the 2012-growing season were downy mildew and Soybean vein necrosis (Table 3) and, in 2013, white mold and sudden death syndrome (Table 4). Downy mildew incidence and severities in all the treatments was 10-15 percent and that of Soybean vein necrosis 5-10 percent incidence with 1-5 percent severity. In both 2012 and 2013, no effect (P<0.05) of fungicide application timing on yield was evident (Table 3 and 4). Variation in yields may be due to various factors like weather conditions, crop rotation, disease pressure, variety planted and efficacy of the products.

Remarks: The 2012 (June – September) and 2013 (July – September) growing seasons in Iowa were very dry with below normal rainfall. Consequently, white mold, sudden death syndrome and foliar disease incidence and severity were low, and it was difficult to detect evidence of an
effect of fungicide on disease (Tables 1 to 4). Similarly, no effect of application timing or multiple application timings were detected (Tables 3 and 4). Although, some treatments have shown higher yield advantage of 4 to 6 bu/ac, on average, the mean yield of soybean to fungicide applications was approximately 2 bu/ac, which agrees with similar reports of Mueller, et al., (2014). Products tested in these studies do not imply endorsement of one company over another, nor did discrimination intended against any similar products.

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References


Shrishail S. Navi is an associate scientist working on soybean diseases.