Impact of Foliar Fungicide on Corn Under Induced Drought Stress
Matthew J. Osterholt* and Alexander J. Lindsey, Department of Horticulture and Crop Science, The Ohio State University, Columbus, OH 43210.
*Presenting author.

INTRODUCTION
Agrichemical companies have reported increased yields on corn sprayed with a foliar fungicide under environmental stress. Drought is one of the most yield-reducing environmental stressors on a annual basis. In 2012 alone, an estimated 4 billion bushels in the U.S. were lost due to drought stress. From V8 through V16, the number of potential kernels in each row (row number is determined before V8) is determined within the corn plant based on environmental cues. To maximize kernel set on corn sprayed with a foliar fungicide under environmental stress, Drought treatment is determined before V8 and is determined within the corn plant based on environmental cues.

OBJECTIVES
1) Determine the impacts of late vegetative drought stress on corn growth, development, and yield potential
2) Measure how an early season application of foliar fungicide affects growth, development, and yield potential.

METHODS
A greenhouse experiment was conducted from Oct. to Dec. 2015 in Hall Greenhouses at Ohio State University.

Pioneer corn hybrid P0965AM1 was used for the research.

Full factorial of treatments:
- Fungicide application
  - Prothioconazole + trifloxystrobin (Strageto YLD) applied at 37 + 110 g a.i./ha (Figure 1)
  - Applied at V4, V6, or V4 + V6, and untreated control
- Drought treatment
  - 15 day drought starting at V8 leaf stage (Figure 2)
  - Experiment was conducted as a Randomized Complete Block with four replications

Heat and leaf stage were measured weekly. Heat units were calculated using the average daily temperature minus the base (10°C).

Total biomass, ear biomass, and yield potential were measured at the R1 stage (Figure 3)

Data were analyzed using SAS 9.4.

RESULTS

Figure 4. Plant height accumulation from planting to harvest. Significant differences of height for plants within the drought treatments are denoted by sign (α=0.05).

Table 1. Total biomass, ear biomass, average number of kernel rows (ROW), average number of kernels per row (KPR), and total kernels per ear (KPE). No significant fungicide effects were observed. Uppercase letters denote differences between drought treatments. Lowercase letters denote differences of the drought by fungicide interaction. Absence of letters denotes non-significance.

<table>
<thead>
<tr>
<th>Drought Treatment</th>
<th>Fungicide Application</th>
<th>Total Biomass (grams)</th>
<th>Ear Biomass (grams)</th>
<th>ROW</th>
<th>KPR</th>
<th>KPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>NONE</td>
<td>114.01A</td>
<td>0.40c</td>
<td>13.5B</td>
<td>39.92</td>
<td>539b</td>
</tr>
<tr>
<td></td>
<td>V4</td>
<td>106.01A</td>
<td>0.92b</td>
<td>14.0B</td>
<td>44.67</td>
<td>625ab</td>
</tr>
<tr>
<td></td>
<td>V6</td>
<td>115.17A</td>
<td>1.70a</td>
<td>15.0B</td>
<td>46.17</td>
<td>693a</td>
</tr>
<tr>
<td></td>
<td>V4 + V6</td>
<td>103.58A</td>
<td>0.38c</td>
<td>13.0B</td>
<td>42.33</td>
<td>550b</td>
</tr>
<tr>
<td>Yes</td>
<td>NONE</td>
<td>99.21B</td>
<td>0.54bc</td>
<td>15.0A</td>
<td>43.92</td>
<td>661a</td>
</tr>
<tr>
<td></td>
<td>V4</td>
<td>94.51B</td>
<td>0.58bc</td>
<td>15.0A</td>
<td>46.17</td>
<td>691a</td>
</tr>
<tr>
<td></td>
<td>V6</td>
<td>100.10B</td>
<td>0.54bc</td>
<td>14.5A</td>
<td>43.00</td>
<td>625ab</td>
</tr>
<tr>
<td></td>
<td>V4 + V6</td>
<td>92.60B</td>
<td>0.73bc</td>
<td>15.5A</td>
<td>44.67</td>
<td>693a</td>
</tr>
</tbody>
</table>

DISCUSSION

The drought treatment effectively reduced plant height during the drought period, but the plants were able to accelerate height accumulation and achieve as similar height as the non-drought plants at R1 harvest.

Drought stress reduced total plant biomass and delayed height accumulation, but did not affect kernels per row.

Fungicide applications increased ear biomass under non-drought conditions, but did not influence ear biomass under drought.

Yield potential was influenced more by early season growth (number of kernel rows) than stage of fungicide application.

CONCLUSIONS

In order to validate our results, the research will be conducted again next fall. Based on the results from the first year, potential changes to the experiments methodology will also be considered:
1. Having 6 replications instead of 4;
2. Transporting all plants from the greenhouse to the spray chamber during fungicide applications;
3. Increasing the duration and severity of the induced drought stress; and
4. Delaying harvest to a later reproductive stage to measure grain yield rather than yield potential.

FUTURE RESEARCH

ACKNOWLEDGEMENTS
The authors would like to acknowledge DuPont Pioneer and Bayer CropScience for their donation of materials, and the Undergraduate Research Office at Ohio State for their financial support through the Research Scholar Award Program.