2014

Several research studies have shown an association between soybean cyst nematode SCN and sudden death syndrome (SDS) in soybean, where SDS symptoms and subsequent yield loss tend to be worse in areas where SCN is also present.

Soybean cyst nematode is present in every major soybean producing county in Michigan.

The presence of SDS has been positively confirmed in 25 counties across Michigan as of 2013 (Figure 1).

Research trials were conducted from 2011 through 2013 in a field near Decatur, MI with heavy SDS pressure and initially low to moderate SCN pressure.

Four Pioneer brand soybean varieties with differing SCN resistance sources and SDS resistance levels were compared in 2011-2012, with two more varieties added in 2013 (Table 1).

An SCN HG test conducted in 2011 determined the presence of SCN type 2,5,7 (P188788; P1209332; P1548316) at the trial location.

SDS symptoms were rated using the standard university rating system of disease incidence (DI) on a 0-100% scale and 1-9 disease severity (DS) scale to derive the disease severity index (DSI), where DSI = (DS/9) x DI.

Soil samples were collected just after planting and harvest each year for SCN qualifications.

Foliar SDS development was monitored throughout the season with reported ratings taking place at or around R6 growth stage as symptoms peaked.

Objectives

A three-year field research study was conducted as part of the DuPont Pioneer Crop Management Research Awards (CMRA) Program with Dr. Martin Chilvers, Michigan State University.

The objectives of this study were to evaluate:

- Performance of Pioneer® brand soybean varieties with differing levels of resistance to SCN and SDS
- The interaction between SCN and SDS in their effects on soybean yield in Michigan.
- SCN reproduction on soybean varieties with different resistance sources.

Variety/ Brand* Years used SCN resistance SDS resistance

<table>
<thead>
<tr>
<th>Variety/ Brand</th>
<th>Years used</th>
<th>SCN resistance</th>
<th>SDS resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>92Y53 (RR)</td>
<td>2011-2013</td>
<td>Peking</td>
<td>6</td>
</tr>
<tr>
<td>92Y51 (RR)</td>
<td>2011-2013</td>
<td>PI88788</td>
<td>6</td>
</tr>
<tr>
<td>92M82 (RR)</td>
<td>2011-2013</td>
<td>None</td>
<td>3</td>
</tr>
<tr>
<td>92Y91 (RR)</td>
<td>2011-2013</td>
<td>None</td>
<td>5</td>
</tr>
<tr>
<td>93Y20 (RR)</td>
<td>2013</td>
<td>PI88788</td>
<td>7</td>
</tr>
<tr>
<td>92M75 (RR)</td>
<td>2013</td>
<td>Peking</td>
<td>5</td>
</tr>
</tbody>
</table>

Research conducted by Dr. Martin Chilvers, Michigan State University, as a part of the DuPont Pioneer Crop Management Research Awards (CMRA) Program. This program provides funds for agronomic and precision farming studies by university and USDA cooperators throughout North America. The awards extend for up to four years and address crop management information needs of DuPont Pioneer agronomists, Pioneer sales professionals and customers.
Results

- In all three years of the study, an increase in SCN numbers during the growing season was associated with soybean varieties with no SCN resistance (Figure 2).
- Although SCN reproduction was lower on varieties with PI88788 than those with no SCN resistance, it was much higher than SCN reproduction on Peking resistance.
- In a lab test at the start of the study, the SCN population was found to be type HG 2.5.7, indicating that SCN had broken resistance to the PI88788 resistance source; results that were reflected in SCN reproduction in the field.
- The Peking resistance source resulted in no net increase of SCN numbers in 2011 (Pf/Pi = 1.01) and even reduced the moderate to high SCN numbers in 2012 and 2013, with Pf/Pi ratios of 0.08 to 0.23 across years and varieties.

The SDS pressure at the field location was very high when first observed in 2009, with a 50% yield loss reported by the grower.

Soybean varieties with Peking SCN resistance developed the least amount of foliar SDS symptoms (Table 2). Varieties with PI88788 resistance sources developed intermediate levels of foliar SDS symptoms, while those with no SCN resistance developed the greatest SDS symptoms.

Yields of some varieties were very low due to the heavy SDS disease and SCN pressure (Table 3).

Pioneer varieties 92Y53 and 92M75, which have Peking SCN resistance and moderate resistance to SDS, outperformed all other varieties, including those with PI88788 SCN resistance.

Pioneer variety 92Y91, which also has no SCN resistance but has moderate resistance to SDS, yielded significantly better than Pioneer variety 92M82, but still far less than the other varieties.

The comparison of Pioneer® varieties 92Y91 and 92M75 in 2013 clearly shows the importance of SCN resistance in managing SDS. Both varieties are rated a 5 for SDS (moderate resistance) but 92M75 has Peking SCN resistance, and had greatly reduced levels of SDS compared to 92Y91 which has no SCN resistance.

Conclusions

- Overall, results of this study showed that SCN management is a critical component of reducing symptoms and yield loss associated with SDS.
- Varieties with the appropriate SCN resistance source for the races present in the field (Peking, in this case) and moderate to high genetic resistance to SDS consistently produced the greatest yield.
- Knowing the SCN population type and matching the correct genetic resistance can help reduce SDS and SCN injury.