Status, Trends, and Management of Soybean Studies Death Syndrome and White Mold

X. B. Yang  
*Iowa State University*

Soum Sanogo  
*Iowa State University*

Peter Lundeen  
*Iowa State University*

Michael Uphoff  
*Iowa State University*

Follow this and additional works at: [https://lib.dr.iastate.edu/icm](https://lib.dr.iastate.edu/icm)
STATUS, TRENDS, AND MANAGEMENT OF
SOYBEAN SUDDEN DEATH SYNDROME AND WHITE MOLD

XB Yang, Soum Sanogo, Peter Lundeen, and Michael Uphoff
Department of Plant Pathology, Iowa State University

In the past five to six years disease picture has changed significantly in Iowa soybean production. The 1998 growing season was characterized by the occurrence of several soybean diseases. Two of these diseases, sudden death syndrome and white mold, are discussed in this article, with respect to their current status, trends, and management options.

Sudden Death Syndrome

Sudden death syndrome (SDS), a disease first found in southern US, was reported in four Iowa counties in 1994 and has increased significance since then, especially in the past two years. The disease has become a major concern in some areas in southern Iowa. Last year, the disease occurred in many soybean fields in southeastern Iowa. This year it has been found in many soybean fields in central, eastern, southeastern Iowa, including a few counties in northern Iowa. Apparently the disease is spreading quickly in Iowa. As of August 1998, the disease has been found in 31 Iowa counties as shown in the map (counties with lighter shade are the four counties in which SDS was first reported in Iowa). It is likely that the number of Iowa counties that have SDS is higher than has been reported.

The severity of this disease has also increased. Four years ago, in the four counties where SDS was first found, the disease was only spotted on a few soybean plants. When found in an area, the disease was spotted only in one growers’ fields, often no more than two fields in the area. Our 1998 surveys indicated very high level of SDS in areas where it was spotted a few years ago. For instance, in 1994, the disease was found in two fields in a sector south of Story City. In this year’s survey we found 9 fields in the same area. In a sector of Washington County, the level of infestation has increased from two fields in 1995 to over 30% of the fields in that area.
Future Trend in SDS Development

The prevalence of this disease apparently is increasing in soybean production region in northern US. Two years ago, our laboratory conducted a risk assessment study to quantify the regional development of SDS in Iowa and north-central US, information useful for long-term strategic plan and for allocation of resources, e.g., for resistance breeding and disease management research. Experiment was conducted to quantify the requirements of soil moisture, cold stress, and temperature response functions for the below- and above-ground development of SDS in controlled experiments. Then disease risk was assessed with regional data on soil moisture storage capacity and long-term, weekly temperature and rainfall records in the CLIMEX, a pest risk assessment program that calculates the geographical range favorable for the disease.

The simulations suggest that low rainfall will limit SDS in regions west of the Missouri River, while cold stress will restrict disease north of 43 to 44 degrees latitude. It is further suggested that production areas in the heart of the North-Central region, including eastern Iowa, parts of Illinois, Indiana, and Ohio, are located within the range favorable for SDS. Recent SDS developments apparently support the prediction. In 1998, the disease was first reported in Wisconsin and Ontario, Canada. Epidemics of SDS were reported in central and northern Indiana this year. Currently, we are working on a finer SDS risk map in Iowa, which would be useful to Iowa growers in management of this disease.

SDS on Roundup Ready (RR) Soybeans

One of growers' concern this season is the occurrence of SDS on RR soybean. It has been reported by trade journals that more SDS was found in RR soybeans than conventional soybeans. Because there is little published research information on soybean diseases in RR soybeans, different speculations have been raised. The first reason for people reporting more SDS on RR soybean may be that growers scouted RR soybeans more often than conventional soybeans. The second reason may be that some RR soybeans do not have a good disease package. Once a susceptible variety is planted in an infested field, SDS occurs when environmental conditions are favorable, which was the case of 1998 season.

It is likely that the SDS pathogen has been introduced into some soybean fields and plants are not showing symptoms because of unfavorable environmental conditions or less susceptible varieties were planted. To manage the disease, use of cultivars with some tolerance will be effective. Although some RR soybeans are susceptible to SDS compared to others, there are RR soybeans with a very good SDS tolerance.
Use of this type of RR soybean if available. In one of our 1998 experiments, we compared SDS development on three varieties, BSR 101 which has consistently shown moderate tolerance to SDS, Asgrow 3071 (RR soybean, to be released) and Pioneer 9344 (RR soybean). The varieties were planted in a field heavily infested with SDS and treated with different herbicides. Asgrow 3071 had very little disease compared with Pioneer 9344 (Figure 1).

**SDS Management**

A number of options are available for managing SDS and include spread prevention, disease resistance, planting date, and reduction of physical and biological stresses.

1. **Prevention of spread**
   
   Because the majority of Iowa soybean fields are likely to be free of SDS pathogen, preventing the spread of this pathogen is an effective measure for protecting soybean field from SDS. As for many other soilborne pathogens such as SCN, SDS pathogen can be spread with farming equipment. Means useful for limiting SCN spread are also applicable to SDS. Care should be taken to avoid moving soil from infested areas into SDS-free areas. Scouting is critical in SDS prevention program. SDS symptoms are easy to identify (ISU Extension publication PM-1570). Leaves on infected plants first have scattered yellowish spots between leaf veins. These spots slowly enlarge and form brown streaks (interveinal necrosis), with leaf veins remaining green.

2. **Avoid planting susceptible cultivars**
   
   If SDS has already been found, one should monitor the disease and prevent the build-up of the pathogen population in the fields. Often the disease may be confined to a limited level if it is detected and controlled early. If the disease is severe and causes significant damage, we should avoid planting SDS susceptible cultivars. Susceptible varieties provide the ground for build-up of the pathogen population and thus lead to rapid development of disease epidemics. Planting resistant cultivars can reduce yield-reducing epidemics. Use tolerant varieties if they are available. In their 1999 varieties listing, several companies have SDS tolerance ratings for varieties of late maturity groups.

3. **Delay planting, especially in infested areas**
   
   The high soil moisture and cool soil temperature that are usually encountered in the spring are ideal for soybean root infection by the SDS fungus. Delaying planting can reduce the risk of infection.

4. **Reduce plant stress and control soybean cyst nematode**
   
   Improper drainage and excessive application of agricultural chemicals such as herbicides and fertilizers can impose severe stress on soybean plants and increase SDS severity. Cultural practices such as ridge till that improve drainage and proper fertilization can reduce SDS severity. Controlling soybean cyst nematode is an important step in SDS management, especially when both are present in the same fields.
White Mold

In 1998, white mold was light in Iowa although yield losses of greater than 25% were reported by growers who planted drilled soybean and susceptible varieties. Relatively dry weather in the last two weeks of July reduced the production of white mold apothecia in infested soybean fields, and therefore, soybeans escaped the window of susceptibility for this disease, except for a few that were planted late. Another reason for low level of white mold is that many growers who had significant white mold problems in the past used 30" row spacing, tolerant varieties, or Cobra this year. Light disease pressure, however, provided plant pathologists with a different type of environment to study white mold control. Below we summarize our findings in two aspects: 1) use of Cobra to control white mold, and 2) use of tolerant varieties.

Use of Cobra to Suppress White Mold

Last year, field experiments showed that Cobra was effective in reducing white mold at high disease pressure without surfactant. This year we carried out experiments in three fields at two locations in a regional white mold project which is supported by check-off dollars. Three experiments using different varieties were conducted in production farms at Humboldt and Rudd. Experiment 1 was carried out at Rudd with a susceptible variety (Asgrow 2242), a moderately susceptible variety (BSR101), and a tolerant variety (Asgrow 1901). Two different spray treatments were tested in this location. A yield map for this field is currently being prepared. Experiment 2 was located in a field near Humboldt which had the same three varieties as in Experiment 1. Yield data have been summarized and are included below. For these two experiments, each treatment was repeated and plot size per treatment was one acre. The third experiment was conducted in a field at Rudd with Asgrow 1901 (RR) only. In this experiment, apothecium production also was quantified for treated and non-treated plots. Generally, the results of these experiments, shown in the tables below, support our findings of last year. The chemical, if applied correctly, can effectively control soybean white mold.

<table>
<thead>
<tr>
<th>Variety</th>
<th>% Infected Plants in Check Treatment</th>
<th>% Infected Plants (Sprayed with Cobra on June 23)</th>
<th>% Infected Plants (Sprayed with Cobra in 1st wk of July)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asgrow 2242</td>
<td>30%</td>
<td>25%</td>
<td>15%</td>
</tr>
<tr>
<td>Asgrow 1901</td>
<td>1%</td>
<td>0</td>
<td>1%</td>
</tr>
<tr>
<td>BSR 101</td>
<td>9%</td>
<td>5%</td>
<td>3%</td>
</tr>
</tbody>
</table>

It has been a concern that Cobra applied at the reproductive stage may affect soybean yields, especially when disease pressure is light. Our results further showed that in a season with light disease pressure, the use of Cobra would not reduce yields when applied without surfactant, as indicated by the yield data of Humboldt. The difference among treatments was small and could
be due to experimental error. We will present yield information of experiments 1 and 2 in a future publication (ICM Newsletter) when they are compiled.

### Experiment 2. Control of white mold with Cobra at Humboldt in a production field, 15" row spacing, sprayed at R1 stage

<table>
<thead>
<tr>
<th>Variety</th>
<th>% infected plants with no Cobra</th>
<th>% infected plants in Cobra treatment</th>
<th>Bu/ac for no Cobra treatment</th>
<th>Bu/ac with Cobra with Cobra</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asgrow 2242</td>
<td>23%</td>
<td>5%</td>
<td>42.3</td>
<td>46.3</td>
</tr>
<tr>
<td>Asgrow 1901</td>
<td>0.5%</td>
<td>0.5%</td>
<td>49</td>
<td>48.5</td>
</tr>
<tr>
<td>BSR 101</td>
<td>4.0%</td>
<td>0.1%</td>
<td>49.5</td>
<td>47.4</td>
</tr>
</tbody>
</table>

Our current data together with that gathered by other plant pathologists show that the mechanisms of Cobra effectiveness are: 1) induction of soybean plants to produce a compound which is resistant to white mold infection, 2) reduction of the density of soybean canopy which results in less production of white mold mushrooms in an infested field. Our results from Rudd in 1998 clearly demonstrate the latter point.

### Experiment 3. Control of white mold with Cobra at Rudd

**Cultivar = Asgrow 1901, 30" row spacing, sprayed at R1 stage**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Apothecia/sq-yard</th>
<th>Infected plants August 17</th>
<th>Infected plants Sept 1st</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spray</td>
<td>1.73</td>
<td>1%</td>
<td>5%</td>
</tr>
<tr>
<td>Not Sprayed</td>
<td>3.65</td>
<td>20%</td>
<td>30%</td>
</tr>
</tbody>
</table>

Below are summarized our findings on the use of Cobra to control white mold:

1. Application of Cobra consistently increases yield in susceptible varieties when disease pressure is high.

2. When disease pressure is low, application of Cobra without surfactant at the R1 growth stage may not reduce yield.

3. It is not beneficial to use Cobra if a reliable, tolerant variety is planted because a tolerant variety can reduce white mold as effectively as Cobra.
White Mold Resistant Varieties

We continued the variety test this past season at two locations, Kanawha and Mason City. The disease was light in Kanawha and data were not collected. The experiment at Mason City was assisted by Kevin Muhlenbruch at Northern Iowa Community College. A high disease pressure was observed at this location with up to 80% of plants killed in susceptible check varieties. At the same location, in collaboration with Bruce Voss, we also tested about 800 entries of the Iowa Crop Yield Test-Soybeans for white mold tolerance. The information will be available through the ISU extension office.

Future Development

This past year we, as well as Iowa soybean producers, have observed that white mold can be well managed if we understand the biology of this disease and apply effective measures. Our laboratory studies indicate that the current white mold strains may have adapted to warmer temperatures compared with strains that were prevalent 20 years ago. White mold can cause damage in southern Iowa since this disease has been found in some areas of that part of the state. However, its spread can be prevented if growers whose fields are not infested use seeds free of the white mold pathogen.

Literature Cited


