2009 WHITE MOLD AND SOYBEAN: IMPACTS AND RECOMMENDATIONS

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Across Wisconsin in 2009, the number one soybean disease observed was Sclerotinia stem rot (SSR), or white mold. Weather conditions around flowering were quite favorable for infection and subsequent development of SSR in 2009 (Figure 1). In Figure 2, we show examples of differences in symptoms we observed throughout the state for SSR and these symptoms will be discussed in more detail in the next section.

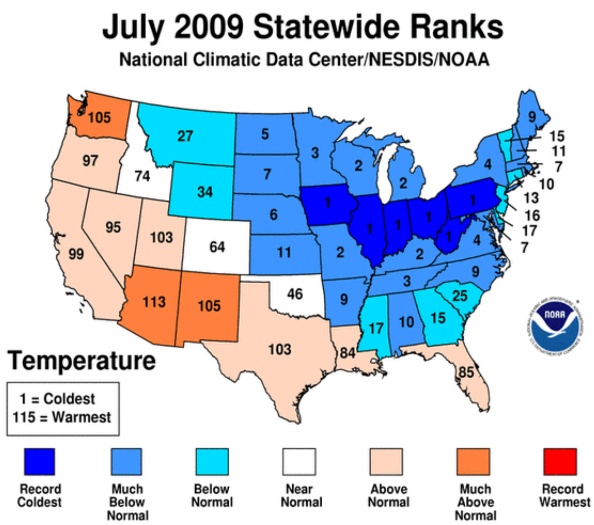

Figure 1. Statewide ranks for July 2009 air temperature across the U.S. (Source: NCDC/NESDIS/NOAA.)

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Figure 2. Symptoms of Sclerotinia stem rot, as observed in fields around Wisconsin in 2009.

Symptoms:

Within the canopy, symptoms may be observed from 3-4 weeks to 6 weeks after flowering, depending on weather, canopy microclimate, and variety. Soybean flowers are infected by spores that are released from apothecia under favorable conditions. Initial lesions that are gray to white in color can be observed at the nodes. Rapidly, these lesions progress above and below the nodes and can encircle the whole stem. The most common symptom is the appearance of the white fluffy mycelium that covers the lesions. As the severity of symptoms progress, black sclerotia can be observed in lesions or inside the stem.

Risk Factors:

SSR is heavily dependent on weather conditions during flower and early pod development. Consideration for both seasonal risk factors and long-term risk factors is important for properly managing SSR. Seasonal risk factors include: (i) cool temperatures (< 85ºF), (ii) normal to above rainfall, increased soil moisture conditions, or prolonged periods of leaf wetness during flowering/early pod, (iii) early canopy closure, (iv) previous history of white mold, and (v) soybean variety. Long-term risk factors include the field or cropping history, weed management, field topography, and the introduction of the pathogen via equipment or windblown spores from areas outside of the field. Many of these factors coincided in 2009, especially cool temperatures.

Yield Loss Due to SSR in 2009:

The overall effect of this disease in 2009 was variable, however, we estimated that the statewide yield loss due to SSR was 10% (based on a 60-bushel per acre soybean harvest). What this really means is that in some situations, yield loss was negligible, while in others fields, yield loss was very high (or even a total loss).

When we examined all of the UW soybean variety trials, we found that the expected yield loss for every 1% increase in SSR was 0.38 bu/a, which was similar to what we have observed in the past where expected yield loss for every 1% increase in SSR was from 0.25 to 0.50 bu/a (Figure 3). Interestingly, it also appears that the most substantial yield loss would be expected once we have approximately 20-25% incidence. When we stratified the results from the different variety trials, we can see that not all field trials had similar levels of SSR nor was there always yield loss due to SSR. In the white mold variety trials, varieties did show a differential response, and overall, there was a good correlation between white mold incidence and yield (r = -0.59), whereas in the soybean cyst nematode, southern region, and central region variety trials, there was no correlation.

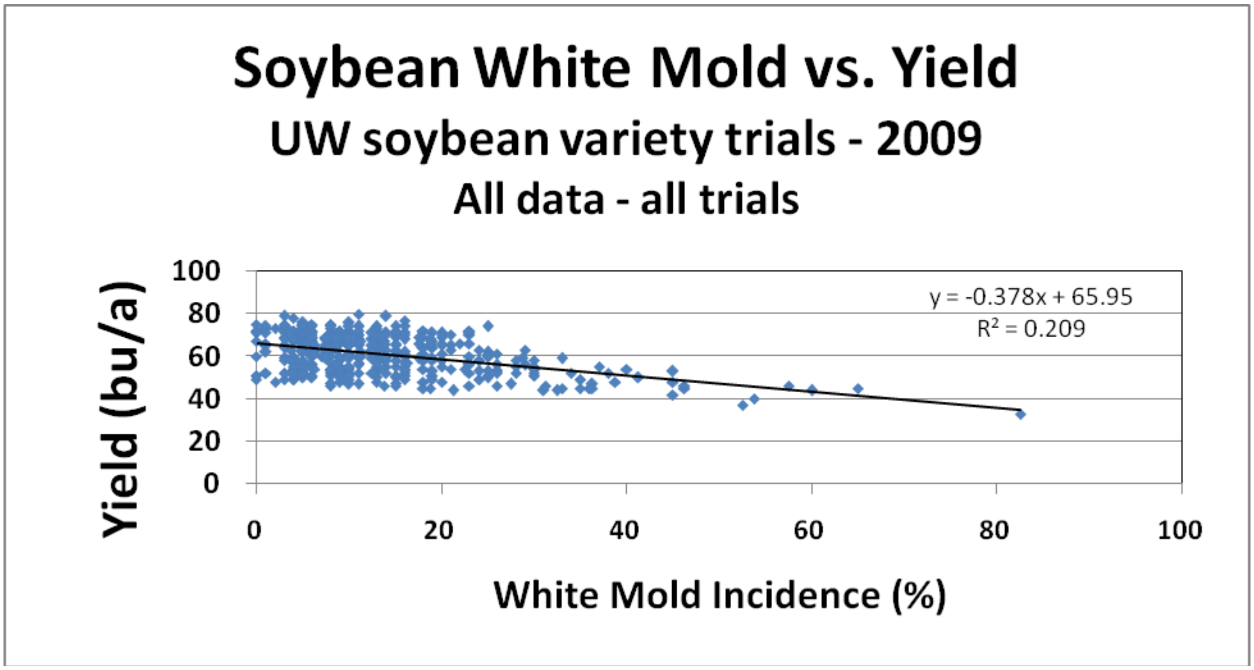

Figure 3. Plot of yield as a function of white mold incidence in 2009 across all UW soybean variety trials. The slope of the regression indicated that for every 1% increase in the incidence of SSR, yield would decrease by approximately 0.38 bushels/a. All data were collected at the R6-R7 growth stage.

Fungicide Trial – Marshfield:

A foliar fungicide trial was conducted at the Marshfield ARS in 2009. In this trial, a susceptible soybean variety was used and five products were examined, including two experimentals. All applications were made at flowering (R1) and at that time of assessment, there were negligible levels of disease as would normally be expected. Disease incidence (plot scale) was measured on 9 September, and disease severity (plant scale) was measured on 29 September. Results from this trial indicated that there was no evidence of an effect of foliar fungicide on the incidence of SSR in early September, however, by the end of September, there were some differences being observed. In particular, Omega (fluazinam; currently not labeled for use in soybean) did show some reduction in the levels of SSR at some rates as did some of the experimental products. Overall, there was no evidence of any differences in the treatments when we analyzed grain yield data.

Table 1. Results from the SSR fungicide trial conducted at the Marshfield ARS in 2009.

Treatment	Incidence (%)	Severity (%)	Moisture (%)	Yield (13%) (bu/a)	Protein (%)	Oil (%)
UTC	15.9	15.9	13.6	39.3	35.6	16.6
Exp1, 16 oz/A	18.8	18.0	13.9	38.0	35.6	16.5
Exp1, 31 oz/A	16.3	36.0	13.9	38.3	35.6	16.6
Exp2, 8 oz/A	14.3	20.8	14.0	39.5	35.7	16.4
Exp2, 16 oz/A	23.8	32.3	14.4	35.2	35.8	16.4
Exp2, 24 oz/A	18.8	33.8	14.2	37.0	36.3	16.1
Topsin, 1 lb/A	21.3	29.5	14.3	38.0	35.2	16.6
Domark, 5 oz/A	17.5	19.8	13.9	37.7	35.9	16.5
Omega, 0.5 pt/A[z]	22.5	27.8	13.5	35.3	34.9	16.8
Omega, 0.75 pt/A	9.0	12.0	13.4	34.6	34.8	17.0
Omega, 1 pt/A	14.3	17.3	13.5	36.8	35.4	16.9
P-value	0.2569	0.0794	0.0046	>0.5	0.1842	0.0713
LSD (10%)	NSD	14.5	0.44	NSD	NSD	0.43
CV (%)	43	53	3	10	2	2

[z]Omega is currently not labeled for use on soybean.

Biological Control for SSR:

We received numerous questions during this past growing regarding the efficacy of using Contans WG for control of SSR. We have written a Soy Report blog article (Dated 30 November 2009) that discusses the current state of knowledge and conditions that may affect efficacy of Contans WG like application timing, application rate, and tillage.

Briefly though, Contans WG is commericial formulation of a fungal pathogen of *Sclerotinia sclerotiorum*, *Coniothyrium minitans*. The mode of action of *C. minitans* is such that it must come into contact with a sclerotium and then through a process of chemical etching can cause the sclerotium to disintegrate.

Currently, we commenced with several studies that examine Contans WG specifically for the questions identified above. Prior to application of Contans WG at our trial sites, we soil sampled and tested for *C. minitans* and found that there is a very low native population of *C. minitans*. Continued measurement of the soil populations of this fungus will help us to monitor establishment and population dynamics over time. Also, our results from trials that were conducted in conjunction with our fungicide trial at Marshfield indicated no effect of Contans WG on SSR incidence or severity with a single year application in the soil. This was not surprising since much of the literature has indicated it takes upwards of three years for complete establishment.

Recommendations for 2010:

Effective control of SSR integrates multiple factors, from knowledge of the field history, variety selection, canopy management, crop rotation, tillage, and weed control. Consult Soyhealth (http://www.plantpath.wisc.edu/soyhealth or http://www.youtube.com/watch?v=rdc7ac60R0M) for core recommendations for managing SSR based on field history. For variety tolerance information please refer to the University of Wisconsin white mold variety test at www.coolbean.info.