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Use of Fungicides to Control Soybean Foliar Diseases: a 6-year Summary

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Prior to 2005, foliar diseases were not of major concern to soybean production in Iowa and much of the north central region, except for soybean seed production. However, since the report of Asian soybean rust in South America in 2001 and then in the United States in 2004, interest in fungicide applications in soybean production has increased consistently, making use of fungicides on soybeans a hot topic.

Survey of the literature related to fungicide use on soybeans shows a disagreement among researchers, university extension recommendations, and industry applications. We have been puzzled by the discrepancy and recognize that the soybean price doubling was a driving force to fungicide sprays. But we are not sure if it is the only force.

Last week, a seminar on climate change presented by Dr. Elwynn Taylor sheds light on the increased use of fungicides in Iowa. Data from Dr. Taylor showed that Iowa annual precipitation days are increasing, especially in the last five years. One hundred years ago, the annual precipitation was 75 days per year. In the year 2000, the number was about 100 days per year. Since 2004, the number has been over 120 days per year. It seems to us that increased disease risk from higher precipitations leads to increased use of fungicides (foliar sprays and seed treatment). Dr. Taylor is going to present his findings at the [Iowa State University Integrated Crop Management Conference](#) Dec. 10-11, 2008. We will also present our findings at the conference.

Field tests of fungicide applications

Since 1993, we have tested various fungicides at the request of chemical companies to determine optimal dose and application times. The treatments varied by chemical compounds, chemical dose, and timing of application. In some seasons, over 50 treatments were tested in multiple locations with four replications for each treatment. In each year, the fungicide trials were comprised of several fungicides from Arysta LifeSciences, BASF Corporation, Bayer CropScience, Cheminova Inc., Dow AgroSciences, DuPont, HeadsUp, Shaeffer, Syngenta Crop Protection, United Phosphorus Inc. and Valent USA.

Entries from chemical companies vary from year to year and the soybean varieties planted were also varied from year to year. The experiments were established at various ISU research farms, such as Northeast Research Station, in Nashua. On farm testing was also conducted in some years. In each experiment, a typical plot consisted of eight rows, with four rows unsprayed border. Rows in plots were 30 inches apart. A randomized complete block design with four replications was used. Plot yields (bu/ac), the incidence (%) and severity (%) of foliar diseases and white mold were recorded. We summarized the fungicide efficacy of our data collected over the previous 6 years. We also have reference data published by our colleagues in other laboratories at Iowa State University.

Table 1 summarizes the six-year results by ranking non-spray control treatment tested along with all-sprayed treatments. Our results clearly showed that use of fungicide as a preventative measure can increase yields in a season when disease pressure is moderate or high. In such a season, many fungicide treatments yielded better and a few treatments increased yield over 10 bushels. Keep in mind that treatments in our experiments were to find effective compounds and their optimum spray time in comparison to standard treatments. Therefore, many fungicide treatments did not increase yields. In seasons with a low disease pressure, only a few treatments with better efficacy, made with fungicide spray applications and at the optimum stage of growth, consistently produced higher yields.

Below are major findings:

- 1) There are treatments consistently ranked top in terms of increase in yields in our multiple year tests (except for one season) even when disease pressure was low to moderate.
- 2) Application at R1 or earlier did not pay off, except for the Cobra which is to control white mold.
- 3) Application at R3 consistently produced highest yields.
- 4) Application twice in a season was no better than a single application at R3 in Iowa.

Table 1.
Summary of fungicide trials conducted at ISU Research farms* during 2003- 08.
 Yield rank is in ascending order, the smaller the number in the rank, the lower the yield.

| Year | Location(s) | Number of Treatments | Overall foliar disease severity | Treatment yield range Bu/Ac | No spray check yield Bu/Ac | Rank for check |
|------|--------------------------|----------------------|---------------------------------|-----------------------------|----------------------------|----------------|
| 2003 | Nashua | 8 | Low to Moderate | 35.7–46.4 | 39.7 | 3 |
| 2004 | Nashua | 14 | Low to Moderate | 54.3–60.1 | 57.4 | 10 |
| 2005 | Nashua - 1 | 18 | Low to Moderate | 68.4–76.3 | 68.1 | 1 |
| 2005 | Nashua - 2 | 27 | Low to Moderate | 71.6–78.5 | 71.6 | 1 |
| 2005 | Crawfordsville | 22 | Low to Moderate | 59.8–71.8 | 65.2 | 10 |
| 2006 | Nashua - 1 | 7 | Low to High | 52.5–62.3 | 52.5 | 1 |
| 2006 | Nashua -2 | 12 | Low to High | 55.4–63.3 | 63.3 | 11 |
| 2006 | Nashua | 24 | Low to High | 68.5–77.1 | 71.6 | 5 |
| 2007 | Nashua – 2 spacing trial | 8 | Low to High | 62.6–66.0 | 64.5 | 4 |
| 2007 | Ames, (Curtiss farm) | 27 | Low to High | 35.8–39.3 | 37.4 | 11 |
| 2007 | Newhall-Grower | 8 | Low | 75.5–87.15 | 79.2 | 4 |
| 2008 | Nashua | 22 | Low to Moderate | 56.0–65.3 | 56.8 | 5 |
| 2008 | Ames, (Agronomy farm) | 13 | Low to Moderate | 39.0–46.8 | 41.7 | 4 |

*Northeast research and demonstration farm, Nashua; Southeast research and demonstration farm, Crawfordsville; Central Iowa research and demonstration farms (Hinds, Curtis, and Agronomy) Ames, IA.

Summary

Fungicide application is best reserved for seasons when foliar diseases are severe. Correct assessment of potential disease pressure is a key for a good decision. When disease is prevalent and severe in a season, application of fungicide is likely to increase yields. Research indicates, the higher the foliar disease severity, the greater the return from the use of fungicides.

At the December 2008 ICM conference at Ames, will present our data in detail and discuss when and how to make spray decision.

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