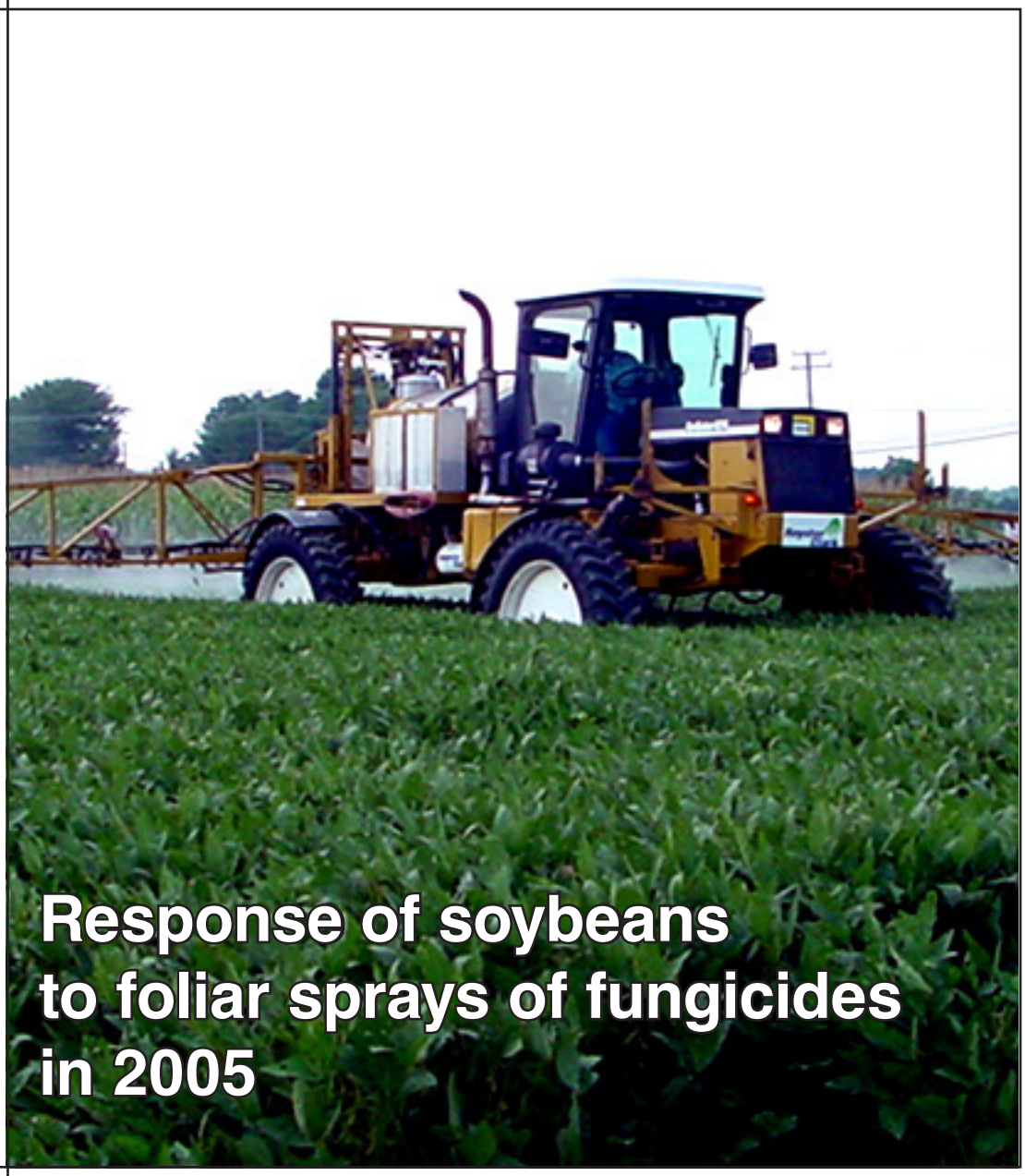
SOYBEAN DISEASE CONTROL



# Response of soybeans to foliar sprays of fungicides in 2005

*Patrick M. Phipps, Professor, Tidewater Agricultural Research and Extension Center*
*Darcy Partridge, Post-doctoral Research Associate, Tidewater Agricultural Research and Extension Center*
*Erik L. Stromberg, Professor, Department of Plant Pathology, Physiology, and Weed Science, Virginia Tech*
*Steve Rideout, Assistant Professor, Eastern Shore Agricultural Research and Extension Center*
*Glenn Chappell, Extension Agent, Agriculture and Natural Resources, Prince George County*
*David Holshouser, Associate Professor, Tidewater Agricultural Research and Extension Center*

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## Disease Incidence and Losses in 2005

Five regional sentinel plots and 90 commercial fields, 56 of which contained a small planting of an early-maturing variety, were scouted weekly for early detection of soybean rust and monitoring occurrences of common foliar diseases of soybeans. In addition, four spore traps were maintained weekly for early detection of soybean rust inoculum at regional sentinel plots. Although a few rust spores were collected in spore traps, no occurrences of soybean rust were found in sentinel plots, field trials, or grower fields. Table 1 lists the statewide estimate of disease losses in 2005. Figures illustrate the most commonly observed diseases. The most aggressive and widespread disease during the pod-filling stages was frogeye leaf spot. Cercospora blight was the most aggressive foliar disease in the final weeks of the growing season, and the same organism resulted in moderate to high levels of purple seed stain.

**Table 1. Estimated loss in yield as a result of soybean diseases in 2005.**

| Disease | Causal agent(s) | Percent loss |
|---|---|---|
| Seedling diseases | *Rhizoctonia solani, Pythium ultimum,* etc. | 0.5 |
| Downy mildew (Fig. 1) | *Peronospora manshurica* | Trace |
| Frogeye leaf spot (Fig. 3) | *Cercospora sojina* | 1.5 |
| Phytophthora root & stem rot | *Phytophthora megasperma* f.sp. *glycinea* | 0 |
| Anthracnose (Fig. 6) | *Colletotrichum truncatum* | 1.0 |
| Pod & stem blight (Fig. 7) | *Diaporthe phaseolorum* var. *sojae* | 0.5 |
| Stem canker | *Diaporthe phaseolorum* var. *caulivora* | 0.1 |
| Sclerotinia stem rot | *Sclerotinia sclerotiorum* and *S. minor* | 0 |
| Southern blight | *Sclerotium rolfsii* | 0.2 |
| Root & lower stem rot | *Rhizoctonia* spp. | Trace |
| Purple seed stain | *Cercospora kikuchii* | 0.2 |
| Cercospora blight (Fig. 4) | *Cercospora kikuchii* | 0.8 |
| Brown spot (Fig. 2) | *Septoria glycines* | 0.5 |
| Red crown rot | *Cylindrocladium parasiticum* | 0.3 |
| Brown stem rot | *Phialophora gregata* | 0.3 |
| Charcoal rot | *Macrophomina phaseolina* | Trace |
| Target spot (Fig. 5) | *Corynespora cassicola* | Trace |
| Viruses | SMV, PMV, BPMV, etc. | Trace |
| Bacterial pustule (Fig. 9) | *Xanthomonas phaseoli* | Trace |
| Bacterial blight (Fig. 8) | *Pseudomonas glycinea* | 0.2 |
| Soybean cyst nematode | *Heterodera glycines* | 2.0 |
| Other nematodes | Root-knot, Stubby root, Sting, Lance, etc. | 1.9 |
| **Total loss (%)** ..... | | **10.0*** |

* The loss estimate equals 1.71 million bushels based on production of 15.37 million bushels in 2005. At a value of $5.50/bu, the loss in revenues at the farm gate would be $9.41 million.

## Downy mildew *(Peronospora manshurica)*

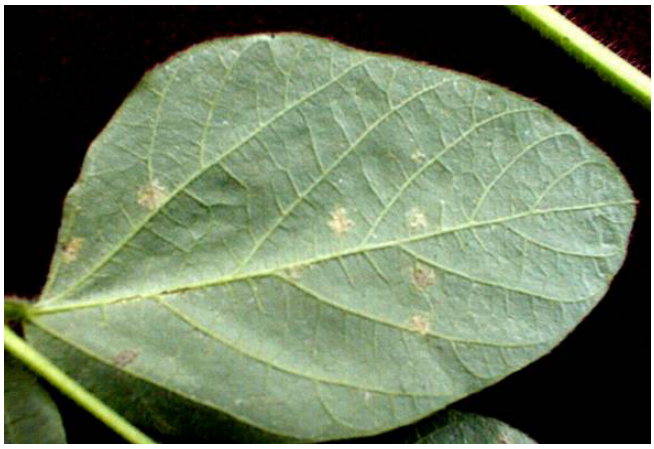

Figure 1A: Downy mildew on lower leaf surface

Figure 1B: Yellow spots with downy mildew

## Brown spot *(Septoria glycines)*

Figure 2A: Disease on upper/lower leaf surfaces

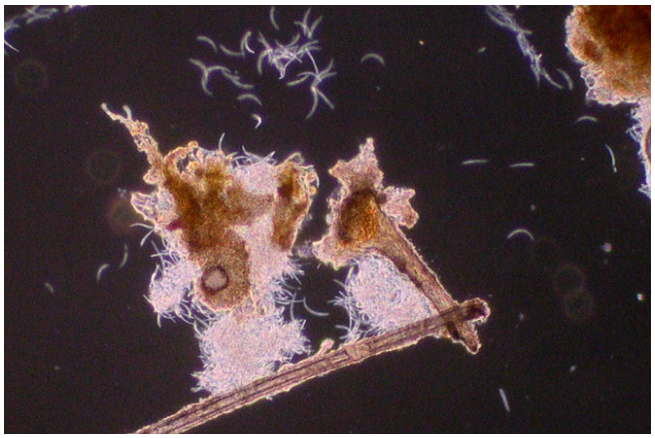

Figure 2B: Fungus pycnidia and spores

## Frogeye leaf spot *(Cercospora sojina)*

Figure 3A: Spots on upper/lower leaf surfaces

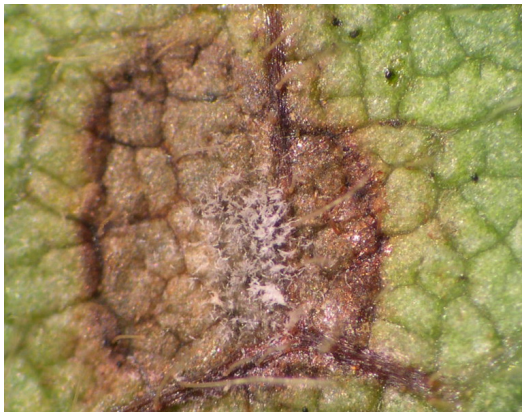

Figure 3B: Sporulation of fungus in lesion

## Cercospora blight and purple seed stain *(Cercospora kikuchii)*

Figure 4A: Cercospora blight of leaves

Figure 4B: Purple seed stain

## Target spot *(Corynespora cassicola)*

Figure 5A: Target spot lesions on lower leaves

Figure 5B: Lesions on upper leaves

photos by S. Koenning

## Anthracnose *(Colletotrichum* spp.*)*

Figure 6A: Black fruiting bodies at random on stem

Figure 6B top: Microscopic view of spores
Figure 6B bottom: Seed infection

Figure 6C: Fruiting bodies of fungus on leaf surface

## Pod and stem blight *(Phomopsis longicolla)*

Figure 7A: Black fruiting bodies in rows

Figure 7B: Growth of fungus on seed appears chalky.

## Bacterial blight *(Pseudomonas syringae* pv. *glycinea)*

Figure 8A: Early symptoms on young leaves

Figure 8B: Lesions merge to cause blight of leaf

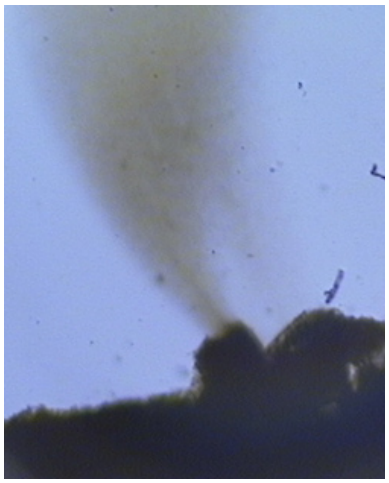

Figure 8C: Bacteria streaming from blighted tissue

photos by S. Koenning

## Bacterial pustule *(Xanthomonas campestris* pv. *glycines)*

Figure 9A: Lesions on upper/lower leaf surfaces

Figure 9B: Pustules on lower surface of leaf

## Seasonal Air Temperatures and Rainfall in 2005

All sites, except the Eastern Shore Agricultural Research and Extension Center (AREC) at Painter, reported below normal rainfall (Table 2). The most severe drought stress occurred at the Glenn Hawkins' farm in Skippers. Weather data were obtained from the Peanut/Cotton InfoNet (*http://www.ipm.vt.edu/infonet*) for the Tidewater AREC in Suffolk and Glenn Hawkins' farm at Skippers. The Virginia Agricultural Experiment Station Mesonet (*http://www.ahnrit.vt.edu/research/weather.html*) collected weather data at the Eastern Virginia AREC at Warsaw and the Eastern Shore AREC at Painter. Normal rainfall records were obtained from annual reports by the Virginia Agricultural Statistics Service.

**Table 2. Weather summary for trial locations, 2005.**

| | | 2005 Air Temperatures (F) | | | | Rainfall (in.) | |
|---|---|---|---|---|---|---|---|
| **Location** | **Month** | **Avg.** | **Max** | **Min.** | | **2005** | **Normal** |
| Tidewater AREC, Suffolk | MAY | 62.6 | 74.5 | 52.1 | | 3.81 | 3.83 |
| | JUN | 74.2 | 84.9 | 64.5 | | 2.07 | 4.25 |
| | JUL | 79.0 | 89.8 | 70.5 | | 4.57 | 5.90 |
| | AUG | 77.9 | 89.4 | 68.8 | | 2.31 | 5.75 |
| | SEP | 72.8 | 85.3 | 62.1 | | 2.6 | 4.46 |
| | OCT | 60.8 | 71.3 | 52.1 | | 6.41 | 3.46 |
| | **Mean** | **71.2** | **82.5** | **61.7** | **Total** | **21.77** | **27.65** |
| Hawkins Farm, Skippers | MAY | 63.6 | 75.3 | 52.5 | | 2.49 | 4.01 |
| | JUN | 74.9 | 85.8 | 65.1 | | 1.96 | 3.44 |
| | JUL | 80.4 | 91.7 | 71.1 | | 2.3 | 4.49 |
| | AUG | 79.4 | 91.6 | 69.2 | | 0.61 | 4.53 |
| | SEP | 74.0 | 87.5 | 62.9 | | 1.67 | 3.41 |
| | OCT | 60.7 | 71.5 | 52.0 | | 3.33 | 3.14 |
| | **Mean** | **72.2** | **83.9** | **62.1** | **Total** | **12.36** | **23.02** |
| Eastern Shore AREC, Painter | MAY | 59.2 | 68.4 | 50.4 | | 4.02 | 3.48 |
| | JUN | 72.8 | 80.8 | 64.9 | | 5.14 | 3.34 |
| | JUL | 78.7 | 87.2 | 70.7 | | 1.67 | 4.29 |
| | AUG | 77.9 | 86.1 | 70.2 | | 3.08 | 3.80 |
| | SEP | 71.7 | 82.0 | 61.2 | | 0.23 | 3.16 |
| | OCT | 61.2 | 68.8 | 53.3 | | 6.89 | 3.08 |
| | **Mean** | **70.3** | **78.9** | **61.8** | **Total** | **21.03** | **21.15** |
| Eastern Virginia AREC, Warsaw | MAY | 60.6 | 71.3 | 50.0 | | 3.40 | 4.55 |
| | JUN | 73.9 | 83.8 | 64.5 | | 2.21 | 3.67 |
| | JUL | 78.2 | 88.0 | 69.5 | | 4.60 | 4.20 |
| | AUG | 78.0 | 88.4 | 68.9 | | 2.58 | 4.17 |
| | SEP | 71.8 | 85.0 | 59.9 | | 1.30 | 4.16 |
| | OCT | 58.9 | 68.2 | 49.9 | | 5.59 | 3.37 |
| | **Mean** | **70.2** | **80.8** | **60.5** | **Total** | **19.68** | **24.12** |

## Field Trial Design and Procedures

Plots were 30 to 35 feet long and 9 to 12 feet wide. Row spacing ranged from 7.5 to 36 inches depending upon location. A randomized complete block design was used with four or five replications of treatments. Treatments were applied with either a $CO_2$-pressurized backpack sprayer in a 6-foot spray swath or a high-clearance, LeeSpider sprayer in a 12-foot spray swath. Both sprayers were equipped with 8002VS nozzles spaced 18 to 20 inches apart and delivered a spray volume of 16.5 gal/A at 30 psi. Disease and yield data were collected from the central, 4.75-foot strip of rows in each plot. Standard practices for soybean production were followed after planting each trial. Plots were harvested with a self-propelled, small-plot combine. Subsamples of 100 seeds from each plot were weighed and numbers with purple seed stain and/or Phomopsis seed decay were recorded. Disease incidence and severity were recorded at multiple times (2- to 3-week intervals) throughout the growing season and defoliation was assessed when soybeans were senescence and approaching full maturity.

## Results

**Tidewater AREC, Trial 105 (Phipps and Partridge).** The field site was planted to Asgrow 5603RR on May 23, 2005. The soil type was Nansemond fine sandy loam that was planted to corn in 2004. Plots were four, 30-foot rows spaced 36 inches apart. All treatments were applied using a LeeSpider sprayer. The timing of fungicide application(s) was designed to evaluate one spray at $R_3$ (August 16) or $R_5$ (August 29) and two sprays at $R_3$ and $R_5$. Roundup Ultra Max at 22 fl oz/A was applied prior to planting on June 13 and July 27 for weed control. Plots were harvested on October 26 and November 11 as a result of weather delays and an equipment breakdown. None of the treatments caused symptoms of chemical injury to leaves, stems, or pods. Frogeye leaf spot and Cercospora blight were the most prevalent diseases in the trial according to ratings on September 30 (Table 3). Frogeye leaf spot was reduced significantly by all treatments except Folicur on August 16 followed by Stratego on August 29. All treatments provided significant control of Cercospora blight. The greatest increase in yield occurred with Absolute at 3.5 fl oz at $R_5$, but none of the yields were significantly different due to the variability of data across replications. The 100-seed weight was greatest in treatments with Stratego and Absolute, which also significantly reduced the incidence of purple seed stain.

**Tidewater AREC, Trial 205, Suffolk (Phipps and Partridge).** The variety, planting date, cultural practices, and location of this trial were the same as the previous trial. None of the treatments caused visible evidence of plant injury. All treatments provided significant suppression of frogeye leaf spot and Cercospora blight (Table 4). A strobilurin fungicide (Quadris, Headline) or the newest generation of triazole fungicides (Domark and Laredo) were more effective than the first generation of triazole fungicides (Folicur). A combination of a strobilurin and a triazole fungicide (Stratego, Quilt, Headline/Folicur) also provided disease control that was superior to Folicur alone. Seed weight was increased significantly by treatments with either Quadris or Stratego, whereas purple seed stain was reduced significantly only by two applications of the experimental fungicide A12910.

**Other trials in Suffolk, Trials 305 and 405**. These trials were designed to compare fungicide chemistries and application timings. Results were similar to those in Trial 105 and Trial 205 in that some differences in treatments were found in disease, 100-seed weights, and seed infection. No significant differences in yield were found when treatments were compared.

**Dinwiddie County, Trial 605, Carson (Chappell and Phipps).** Soil at the field site was Slagle sandy loam planted in corn and wheat and double-crop soybeans in 2004 and 2003, respectively. Seed of FFR RT557 was planted in rows spaced 7.5 inches apart on July 5 using a John Deere 1590NT drill set for achieving a final plant population of 160,000 plants/A. Standard practices for production of glyphosate-resistant soybeans were followed after planting. Plots were 10 feet wide by 30 feet long and treatments were replicated in five randomized complete blocks. A single application of treatments was made with a backpack sprayer at beginning pod stage ($R_3$) on September 5. Frogeye leaf spot was moderate to heavy as indicated by disease evaluations on September 23 (Table 5). All fungicide programs provided significant reductions in percentage of leaflets with frogeye leaf spot and percentage of leaf area with disease when compared to the untreated check. Laredo 2EC at 7.0 fl oz and Folicur 432SC at 4.0 fl oz were the only treatments that failed to suppress the number of spots per leaflet and the percentage of defoliation on October 19. None of the treatments had a significant effect on 100-seed weight or yield. The incidence of Cercospora blight and purple seed stain was very low in all treatments.

## Table 3. Tidewater AREC, Trial 105, Suffolk (Full-season soybean, Asgrow 5603)

| Treatment, rate/A and spray date | % leaf area w/disease[1] (Sep 30) | | | % defoliation[2] (Sep 30) | Yield[3] (bu/A) | Wt./100 seed (oz) | % purple seed stain[4] |
|---|---|---|---|---|---|---|---|
| | Frogeye leaf spot | Brown spot | Cercospora blight | | | | |
| Untreated check | 11.3 a[5] | 7.0 a | 22.5 a | 26.3 a | 38.4 | 0.436 e | 8.8 ab |
| Folicur 432SC 4 fl oz (8/16, 8/29) ..... | 3.8 d | 3.8 b-d | 15.5 b | 12.5 bc | 36.2 | 0.461 c-e | 11.8 a |
| Folicur 432SC 4 fl oz (8/16) Stratego 250EC 7 fl oz + Induce 0.125% v/v (8/29)..... | 8.0 ab | 5.3 ab | 13.8 bc | 15.0 b | 39.5 | 0.460 de | 11.3 a |
| Folicur 432SC 4 fl oz (8/16) Stratego 250EC 10 fl oz + Induce 0.125% v/v (8/29)..... | 5.5 b-d | 3.8 b-d | 9.5 d | 9.5 cd | 45.1 | 0.455 de | 4.0 cd |
| Stratego 250EC 7 fl oz + Induce 0.125% v/v (8/16) Folicur 432SC 4 fl oz (8/29)..... | 6.0 b-d | 3.0 cd | 8.3 d | 8.5 cd | 35.8 | 0.460 de | 8.8 ab |
| Stratego 250EC 10 fl oz + Induce 0.125% v/v (8/16) Folicur 432SC 4 fl oz (8/29)..... | 4.5 cd | 3.8 b-d | 11.3 cd | 10.3 b-d | 39.7 | 0.483 a-c | 4.5 cd |
| Stratego 250EC 7 fl oz + Induce 0.125% v/v (8/16)..... | 4.3 d | 4.0 b-d | 9.5 d | 7.0 d | 32.7 | 0.463 cd | 7.0 bc |
| Absolute 500SC 3.5 fl oz (8/16, 8/29)..... | 6.3 b-d | 3.5 b-d | 11.8 b-d | 8.5 cd | 36.6 | 0.493 a | 2.3 d |
| Absolute 500SC 5 fl oz (8/16, 8/29)..... | 6.5 b-d | 2.8 d | 8.3 d | 9.8 cd | 34.2 | 0.489 ab | 2.5 d |
| Folicur 432SC 4 fl oz (8/29)..... | 7.8 bc | 5.0 a-c | 15.0 bc | 11.3 b-d | 31.6 | 0.460 de | 12.3 a |
| Stratego 250EC 7 fl oz + Induce 0.125% v/v (8/29)..... | 4.5 cd | 4.0 b-d | 8.8 d | 10.0 b-d | 37.1 | 0.467 b-d | 4.0 cd |
| Stratego 250EC 10 fl oz + Induce 0.125 v/v (8/29)..... | 6.5 b-d | 3.8 b-d | 15.5 b | 12.5 bc | 35.4 | 0.462 cd | 3.5 cd |
| Absolute 500 SC 3.5 fl oz (8/29) ..... | 7.0 b-d | 3.3 b-d | 15.5 b | 10.8 b-d | 46.9 | 0.471 a-d | 4.3 cd |
| LSD ..... | 3.4 | 2.0 | 4.2 | 5.0 | n.s. | 0.022 | 4.2 |

[1] Frogeye leaf spot and Cercospora blight were prevalent in upper canopy; brown spot occurred mostly in lower canopy.
[2] Defoliation rating scale: 0 = none, 100 = no leaves on plants.
[3] Yield of soybeans with 13.5% moisture (1 bu = 60 lb).
[4] Data are percent of seed with symptoms and signs of disease.
[5] Means followed by the same letter(s) in a column are not significantly different at $P$=0.05 according to Fisher's Protected LSD; n.s. denotes differences not significant.

## Table 4. Tidewater AREC, Trial 205, Suffolk (Full-season soybean, Asgrow 5603)

| Treatment, rate/A and application date | % leaf area w/disease (Oct 1)[1] Frogeye leaf spot | Cercospora blight | % defoliation[2] (Oct 1) | Yield[3] (lb/A) | Weight/ 100 seed (oz) | % purple seed stain[4] |
|---|---|---|---|---|---|---|
| Untreated check | 8.3 a[5] | 35.0 a | 25.0 a | 32.1 | 0.469 b-e | 17.5 a-e |
| Folicur 432SC 4 fl oz (8/16) | 2.8 c-e | 20.0 b | 17.0 b | 32.9 | 0.462 c-e | 18.5 a-d |
| Quadris 6 fl oz + Crop Oil Conc. 21 fl oz (8/16) ..... | 2.3de | 10.8 g | 9.8 d | 32.0 | 0.490 a | 14.5 b-e |
| Stratego 250EC 7 fl oz + Induce 0.125% v/v (8/16) | 1.8 e | 9.5 g | 7.5 d | 35.5 | 0.490 a | 13.0 de |
| Domark 230ME 5 fl oz (8/16) ..... | 4.8 bc | 16.3 b-f | 11.8 b-d | 33.1 | 0.480 a-c | 21.0 a |
| Domark 230ME 5 fl oz + Orthene 97 8 oz (8/16)..... | 2.5 c-e | 14.0 c-g | 10.0 d | 30.9 | 0.476 a-d | 17.5 a-e |
| Laredo EC 7 fl oz + Induce 2.64 fl oz (8/16).... | 4.3 b-d | 17.5 b-d | 12.5 b-d | 32.0 | 0.459 de | 19.3 a-c |
| Laredo EC 7 fl oz + Induce 2.64 fl oz (8/16) Laredo EC 5 fl oz + Headline 250EC 6 fl oz (8/29) ..... | 2.8 c-e | 11.8 e-g | 9.5 d | 30.9 | 0.466 b-e | 16.5 a-e |
| Laredo EC 7 fl oz + Induce 2.64 fl oz (8/16) Laredo EC 7 fl oz + Dithane DF 2 lb (8/29)..... | 2.3 de | 13.0 d-g | 11.5 cd | 33.4 | 0.476 a-e | 17.5 a-e |
| A9901 400SC 1.03 fl oz (8/16) ..... | 5.3 b | 19.0 bc | 16.0 bc | 32.2 | 0.455 e | 20.3 ab |
| A12910 280SC 4 fl oz (8/16) ..... | 4.0 b-e | 17.0 b-e | 12.0 b-d | 34.0 | 0.476 a-d | 17.0 a-e |
| A12910 280SC 4 fl oz + Crop Oil Conc. 21 fl oz (8/16, 8/29) ..... | 3.3 b-e | 12.0 e-g | 9.5 d | 32.9 | 0.487 ab | 7.0 f |
| Quilt 200SC 14 fl oz + Crop Oil Conc. 21 fl oz (8/16) ..... | 1.8 e | 11.0 fg | 7.5 d | 32.8 | 0.480 a-c | 12.0 ef |
| Headline 250EC 4.7 fl oz + Folicur 432SC 3.1 fl oz (8/16) ..... | 2.3 de | 13.0 d-g | 8.8 d | 31.5 | 0.469 b-e | 13.5 c-e |
| LSD ..... | 2.4 | 5.3 | 5.4 | n.s. | 0.021 | 5.9 |

1 Data represent percent leaf area with symptoms on entire plant.
2 Defoliation rating scale: 0 = none, 100 = no leaves on plants.
3 Yield of soybeans with 13.5% moisture (1 bu = 60 lb). Soybeans were harvested on Nov 11, 2005.
4 Data are percent of seed with disease symptoms.
5 Means followed by the same letter(s) in a column are not significantly different at P=0.05 according to Fisher's Protected LSD; n.s. denotes differences are not significant.

Table 5. Dinwiddie County, Trial 605, Carson (Double-cropped soybean, FFR RT557)

| Treatment, rate/A[1] | % Frogeye[2] (Sep 23) | % leaf area[3] (Sep 23) | No. spots/ leaflet[4] (Sep 23) | % defoliation[5] Oct 8 | % defoliation[5] Oct 19 | 100 seed wt.[6] (oz) | Yield (bu/A)[7] |
|---|---|---|---|---|---|---|---|
| Untreated check | 100.0 a[8] | 8.0 a | 74.8 a | 44.0 | 97.4 a | 0.469 | 26.40 |
| Quilt 1.67SC 14 fl oz + COC 1% v/v | 95.2 f | 2.8 cd | 25.6 c | 38.0 | 90.4 b | 0.464 | 26.30 |
| Stratego 250EC 10 fl oz + Induce 0.125% v/v | 97.4 c-e | 3.2 b-d | 33.6 bc | 38.0 | 91.6 b | 0.474 | 27.21 |
| Headline 2.08EC 4.7 fl oz + Folicur 432SC 3.1 fl oz | 97.2 de | 2.4 d | 18.4 c | 34.0 | 90.0 b | 0.477 | 28.17 |
| Folicur 432SC 4.0 fl oz | 98.6 bc | 5.2 b | 55.6 a | 45.0 | 95.2 a | 0.461 | 29.53 |
| Quadris 2.08SC 6.2 fl oz + COC 1% v/v | 96.6 ef | 2.6 d | 26.0 c | 36.0 | 91.6 b | 0.471 | 27.81 |
| Headline 2.08EC 6.0 fl oz | 98.2 b-d | 3.4 b-d | 34.0 bc | 41.0 | 91.6 b | 0.480 | 27.81 |
| Laredo 2EC 7.0 fl oz + Induce 0.125% v/v | 99.0 b | 4.8 bc | 54.4 ab | 43.0 | 95.0 a | 0.465 | 27.36 |
| LSD (P=0.05) | 1.7 | 2.1 | 21.5 | n.s. | 3.8 | n.s. | n.s. |

[1] A single application was applied at the beginning pod stage (R3).
[2] Percentage of leaflets with one or more frogeye leafspots.
[3] Percentage of leaflet area exhibiting symptoms of frogeye leaf spot.
[4] Number of frogeye leaf spots per leaflet samples from the fourth node.
[5] Percentage of leaflets shed.
[6] Weight (oz) per 100-seed sample after harvest.
[7] Yields are weight of soybeans with 13.5% moisture (1 bu = 60 lb).
[8] Means followed by the same letter(s) in a column are not significantly different (LSD, P=0.05); n.s. denotes differences are not significant. Arcsine of percentage data were used in analysis to determine statistical significance.

**Tidewater AREC, Trial 705, Suffolk (Phipps, Holshouser, and Partridge).** The field site was planted to CL 54RR soybeans on July 1, 2005. The soil type was Eunola loamy fine sand that was fallow in the summer of 2004 and planted to winter wheat in the fall. Plots were ten 34-foot rows spaced 15 inches apart. All treatments were applied using the LeeSpider sprayer. A single application of all treatments was made at beginning pod ($R_3$) on August 29. Roundup Ultra Max at 22 fl oz/A was applied prior to planting and on August 19 for weed control. Plots were harvested on October 12 with a self-propelled, plot combine. None of the treatments caused foliar, stem, or pod damage. Frogeye leaf spot and Cercospora blight were the only diseases in the trial with potential for having an impact on yield. Both diseases were confirmed by incubating leaf samples in a moist chamber to induce fungal growth and sporulation for identification with a microscope. Other diseases found at low levels included brown spot, anthracnose, and traces of pod and stem blight. Cercospora blight was responsible for most of the disease on leaflets on October 14. Treatments with Quilt, Stratego, Headline plus Folicur, Quadris, and Headline alone were the most effective in control of Cercospora blight and reducing defoliation (Table 6). The same treatments also suppressed defoliation significantly according to ratings on October 14. None of the treatments had a significant effect on yield. Quilt, Headline plus Folicur, Quadris, Headline, and MFC Tebuconazole were the only treatments to produce a significant increase in 100-seed weight. The incidence of purple seed stain was reduced the greatest by Quilt, Stratego, Headline plus Folicur, Quadris, and Headline alone.

## Table 6. Tidewater AREC, Trial #705, Suffolk (Double-cropped soybean, CL 54RR)

| Treatment and rate/A[1] | Frogeye leaf spot[2] (Oct 14) | | Cercospora blight[2] (Oct 14) | | % defoliation[3] (Oct 14) | Yield[4] (bu/A) | 100 seed wt. (oz)[5] | % purple seed stain[5] |
|---|---|---|---|---|---|---|---|---|
| | % leaflets | % leaf area | % leaflets | % leaf area | | | | |
| Untreated check ..... | 4.5 | 0.8 | 98.8 a[6] | 40.0 a | 72.5 a | 34.9 | 0.536 c | 39.3 a |
| Quilt 1.67SC 14 fl oz + COC 1% v/v ..... | 3.0 | 0.6 | 33.8 cd | 10.0 d | 26.3 d | 37.4 | 0.564 a | 9.3 c |
| Stratego 250EC 10 fl oz + Induce 0.125% v/v ..... | 3.0 | 0.8 | 41.3 c | 10.0 d | 25.0 d | 33.5 | 0.556 a-c | 4.8 c |
| Headline 2.08EC 4.7 fl oz + Folicur 432SC 3.1 fl oz | 2.0 | 0.3 | 23.8 d | 5.0 d | 17.5 d | 38.0 | 0.563 ab | 7.0 c |
| Folicur 432SC 4 fl oz ..... | 3.5 | 0.3 | 86.3 b | 20.0 bc | 50.0 b | 37.0 | 0.549 a-c | 25.3 b |
| Quadris 2.08SC 6.2 fl oz + COC 1% v/v ..... | 4.5 | 1.0 | 23.8 d | 6.3 d | 23.8 d | 33.4 | 0.568 a | 5.0 c |
| Headline 2.08EC 6 fl oz ... | 2.3 | 0.3 | 25.0 d | 7.5 d | 20.0 d | 35.1 | 0.560 ab | 7.8 c |
| Laredo 2EC 7 fl oz + Induce 0.125% v/v ..... | 3.3 | 0.6 | 80.0 b | 23.8 b | 45.0 bc | 34.1 | 0.539 c | 26.0 b |
| MFC Tebuconazole 3.6 F 4 floz ..... | 5.0 | 1.0 | 81.3 b | 17.5 c | 40.0 c | 35.1 | 0.561 ab | 21.8 b |
| MFC Tebuconazole 3.6 F 4 fl oz + PGR-IV PLUS 1 oz ..... | 3.8 | 0.8 | 82.5 b | 21.3 bc | 41.3 bc | 33.5 | 0.543 bc | 25.0 b |
| LSD..... | n.s. | n.s. | 9.5 | 6.0 | 9.8 | n.s. | 0.57 | 9.0 |

1 A single application was applied at beginning pod (R3) on Aug 29, 2005.
2 Data are based on visual estimates of disease incidence and leaf area affected.
3 Defoliation rating scale: 0 = none, 10 0= no leaves on plants.
4 Yields are weight of soybeans with 13.5% moisture. Soybeans were harvested on Nov 12, 2005.
5 Random samples of seed were collected at harvest for determining 100 seed wt and percentages of seed with purple seed stain.
6 Means followed by the same letter(s) are not significantly different (LSD, P=0.05); n.s. denotes differences are not significant.

**Greenville County, Trial 505, Skippers (Phipps and Partridge).** Chlorothalonil alone (Echo 720), chlorothalonil plus Folicur, and treatments evaluated in the Dinwiddie County Trial # 605 above were evaluated at the Glenn Hawkins' farm in Skippers. Cercospora blight caused heavy damage in untreated plots. Fungicide treatments were applied only at full bloom ($R_2$). Quilt at 14 fl oz with crop oil concentrate (COC), Stratego at 10 fl oz with surfactant, Headline at 6 fl oz, Headline at 4.7 fl oz + Folicur 3.1 fl oz, and Quadris at 6 fl oz with COC were the most effective in control of Cercospora blight and anthracnose. Seed weights were increased significantly by each of the above treatments, but not Folicur at 4 fl oz alone or Echo 720 at 20 fl oz/A. None of the treatments had a significant effect on incidence of purple seed stain or Phomopsis seed blight. Severe drought stress over much of the season resulted in poor yields (range = 9.2 to 11.6 bu/A) and the effect of treatments was not significant.

**Eastern Shore AREC, Painter (Rideout and Waldenmaier).** Trials were conducted on a Bojac fine sandy loam soil (organic matter <1%) on the Eastern Shore near Painter. Standard practices for weed and insect control were followed in each trial. Conventional-tillage, full-season soybeans were planted on May 19 and no-till double-cropped soybeans were planted on July 19 following wheat. Both trials were planted to DynaGro 38T47.

Treatments were applied to the full-season soybeans on July 22 when soybeans were at reproductive stage $R_2$ (full bloom) and no-till soybeans on September 8 at stage $R_3$ (beginning seed). Growing conditions were good throughout July and August, but September was extremely dry with rainfall only 0.2 inch. Foliar disease pressure was low throughout the season in both trials with only scattered downy mildew and frogeye leaf spot present. Infection levels were too low to detect differences in treatments, but defoliation ratings taken in full-season soybeans on September 28 did show significant differences (Table 7). Treatments of Headline, Stratego, or Quadris showed less defoliation than the untreated control. Purple seed stain was extremely low in both trials (average < 2%) and were combined with Phomopsis seed decay for counts and weights. Treatments did not have a significant effect on 100-seed weights in the full-season or double-cropped trial. Treatments with Stratego, Headline, and Quadris resulted in the highest yields in the full-season trial, but differences were not significantly different from the untreated control.

**Table 7. Eastern Shore AREC Trials (Full-season and double-cropped soybeans)**

| | Full-season soybeans | | | Double-cropped soybeans | | |
|---|---|---|---|---|---|---|
| **Treatment and rate** | **Defoliation (%) Sep 28** | **Infected[1] seed (%)** | **Yield bu/A** | **100 seed wt (oz)** | **Infected[z] seed(%)** | **Yield bu/A** |
| Stratego 2.08EC 10 fl oz + Induce 90 0.125% v/v..... | 28 d[2] | 17 a | 62 a | 0.54 a | 10.7 a | 21 a |
| Headline 2F 6 fl oz..... | 31 d | 12 a | 58 a | 0.50 a | 11.7 a | 19 a |
| Headline 2F 4.7 fl oz..... | 39 cd | 11 a | 58 a | 0.54 a | 11.2 a | 15 a |
| Quadris 2.08SC 6 fl oz + COC 85 1.0% v/v ..... | 50 b-d | 12 a | 57 a | 0.52 a | 11.1 a | 18 a |
| Quadris Max 2F 4.1 fl oz ..... | 59 a-d | 14 a | 52 a | 0.53 a | 12.3 a | 21 a |
| Quilt 1.67EC 14 fl oz + COC 85 1.0% v/v ..... | 53 a-d | 13 a | 52 a | 0.50 a | 13.9 a | 16 a |
| Domark 230SC 5 fl oz ..... | 66 abc | 14 a | 52 a | 0.52 a | 15.2 a | 22 a |
| Laredo 2F 7 fl oz + Induce 90 0.125% v/v ..... | 65 a-c | 19 a | 51 a | 0.52 a | 14.8 a | 17 a |
| Folicur 3.6EC 4 fl oz ..... | 76 ab | 16 a | 50 a | 0.50 a | 13.3 a | 16 a |
| Untreated control..... | 84 a | 15 a | 52 a | 0.42 a | 19.3 a | 12 a |

[1] Seed infected with either purple seed stain or Phomopsis seed decay.
[2] Means in columns with the same letter(s) are not significantly different ($P \geq 0.05$, Tukey's HSD).

**Summary: Response of soybeans to fungicide sprays in 2005 for control of common soybean foliar diseases in Virginia**

1. No soybean rust was found in Virginia in 2005. Frogeye leaf spot, Cercospora blight, and anthracnose were the most common foliar diseases with potential to impact soybean yield.

2. Below normal rainfall during the growing season caused periods of dry-weather stress and depressed yields in 2005. Dry weather also suppressed disease development and the potential for significant disease impact on yield.

3. A total of 11 fungicide trials were conducted on full-season and double-cropped soybeans in 2005 at Dinwiddie County, Greensville County, Suffolk, Accomack County, and Richmond County. The experimental procedure in all trials used a randomized complete-block design with four to five replications of treatments in each trial.

4. In general, the strobilurin fungicides (Quadris, Headline) and the prepackaged mixtures of a strobilurin and a triazole (Quilt, Stratego, Headline + Folicur) provided superior control of frogeye leaf spot and Cercospora blight.

5. Treatments with Quilt, Stratego, Headline + Folicur (Headline SBR), Quadris alone, and Headline alone suppressed defoliation significantly in several trials, increased the 100-seed weight, and suppressed seed infection with purple seed stain and/or Phomopsis seed decay.

6. Yields in some trials tended to be higher with one fungicide spray at $R_3$ (Quilt 14 fl oz, Quadris 6.2 fl oz, Headline 6 fl oz, Absolute 3.5 fl oz, Stratego 10 fl oz), but not significantly greater than the untreated check. Fungicide applications at $R_3$ and $R_5$ also failed to increase yield significantly.

7. These trials need to be repeated at multiple locations over at least three growing seasons with normal and/or above normal rainfall to provide confidence in recommending fungicide use patterns for disease control in Virginia.

8. In the absence of soybean rust in Virginia, the value of fungicide sprays may be limited to increasing seed quality according to the results of trails in 2005.

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