Double-Crop Soybean Response to Foliar Fungicides

Virginia Tech
Virginia Agricultural Experiment Station

David Holshouser, Kevin Dillon, & Hillary Mehl
Virginia Tech – Tidewater AREC, Suffolk, VA

Virginia Cooperative Extension
Virginia Tech • Virginia State University

Abstract

Foliar fungicides applications may increase yields in double-crop soybean when environmental conditions are conducive for disease development. However, cultivars may have varying levels of disease tolerance and respond differently to fungicide application. Field experiments were conducted in eastern Virginia in 2012 and 2013 to evaluate disease and yield response of maturity group (MG) IV and V soybean cultivars to foliar applied fungicides in a wheat-soybean double-crop system. Fungicides were applied at the R3, R5, or R3+R5 development stages. Measurements included normalized difference vegetative index (NDVI), Cercospora blight and leaf spot severity, leaf retention, seed yield and yield response to fungicides, purple seed stain, and seed weight and quality. Fungicide application increased yield in 6 of 12 experiments. Fungicide increased seed weight at 5 of 6 locations. Canopy closure and leaf area were limiting factors in yield increase attributed to fungicide. Cercospora blight severity was generally reduced by foliar fungicide applications; however, disease reductions did not always increase yield. Optimum fungicide timing depended on soybean growth, environmental conditions, and disease severity and rate of development. These results should assist research and Extension personnel, crop consultants, industry representatives, and farmers in making agronomic and disease decisions in double-crop soybean systems.

Introduction

- Over half of the Mid-Atlantic soybean acres are planted double-crop after small grain harvest, usually from late-June through early-July.
- Late planting often results in small canopy, which is less conducive for disease development.
- However, pod- and seed-fill stages of double-crop soybean occur during September and October, when pathogen inoculum potential is greater and cooler temperatures are more conducive for disease development.
- Small-plot and on-farm research in Virginia determined that soybean yield responds to foliar fungicides in approximately one-third of the site-years.
- Other on-farm research indicated that soybean cultivars respond differently to foliar fungicides.

Objective

Determine the response of maturity group (MG) IV and V soybean cultivars differing in their susceptibility to Cercospora blight and leaf spot (*Cercospora kikuchii*) to the foliar fungicide, fluxapyroxad + pyraclostrobin (Priaxor™), applied at the R3, R5, or R3+R5 development stages.

Materials & Methods

Site Description

- Experiments were conducted in 2012 and 2013 in three regions of Virginia: northeast (Mt. Holly, Warsaw), southeast (Suffolk), and Eastern Shore (Painter) on typical coastal plain soils.
- Soybean was no-till planted after wheat harvest (late-June to early-July).
- Plot Size was five 38-cm rows x 7.3 m length (end-trimmed to 5.2 m before harvest).

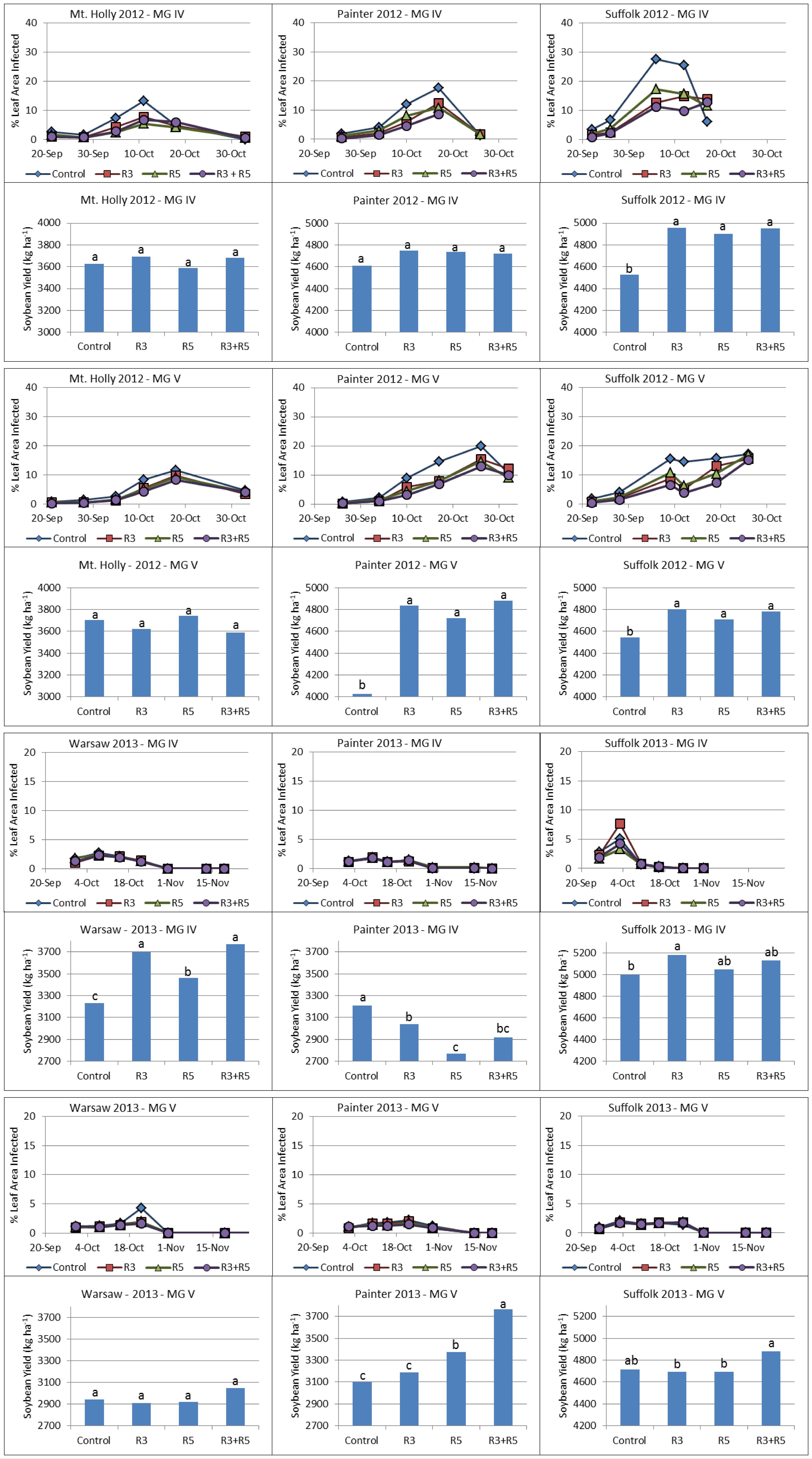
Experimental Design

- Two adjacent experiments per location was conducted and contained either maturity group (MG) IV or MG V.
- Two-factor experiments (10 cultivars x 4 foliar fungicide application timings) were conducted in a randomized complete block with four replications using a strip-plot arrangement with cultivar and fungicide timing as vertical and horizontal treatments, respectively.
  - Fluxapyroxad + pyraclostrobin (Priaxor™) at 49 + 97 g ha^{-1} and NIS at 0.25% v/v was applied at 187 L ha^{-1} across all cultivars with tractor sprayer at the R3, R5, or R3 + R5 development stages.
  - Cultivars exhibited a range of tolerance to Cercospora blight and leaf spot (selected from purple seed stain ratings from 2011 cultivar tests).

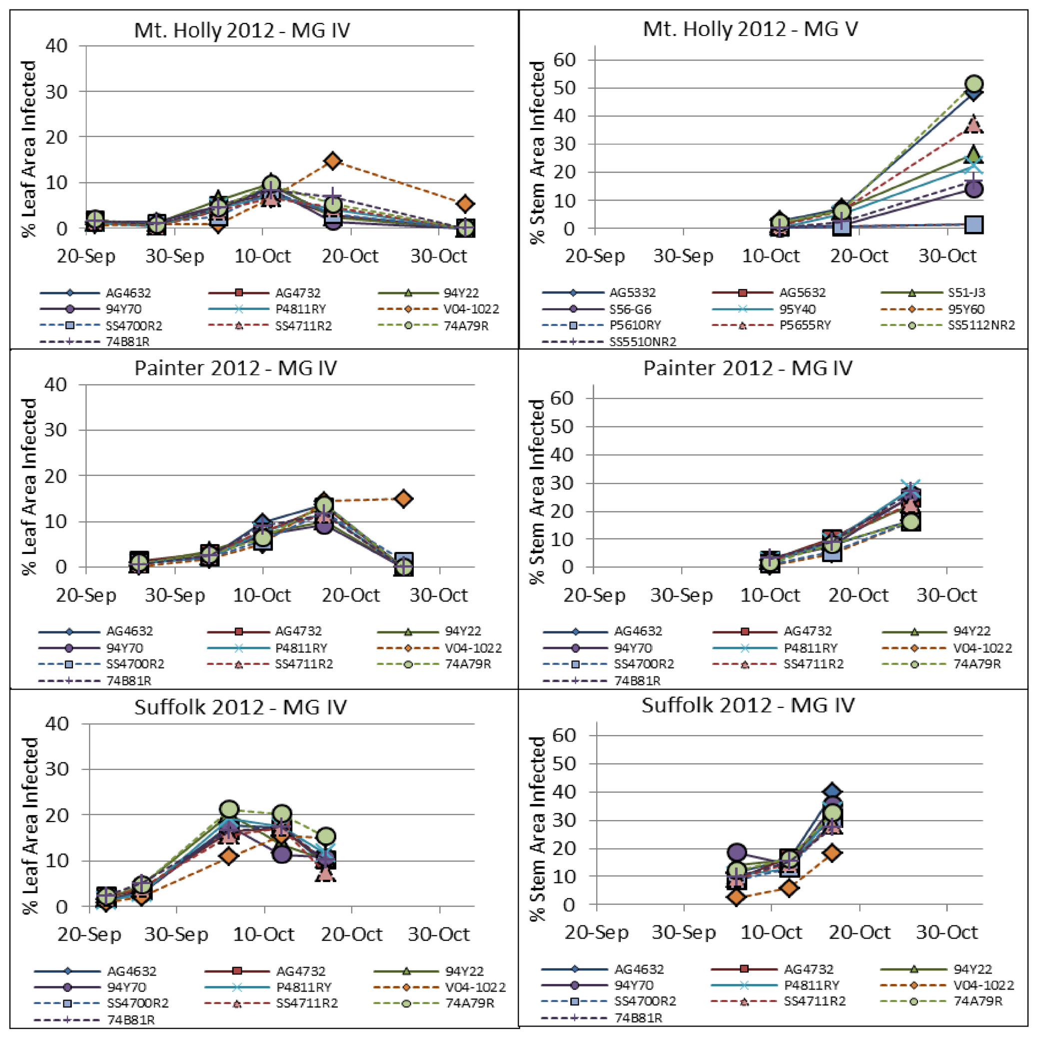
Data Collection

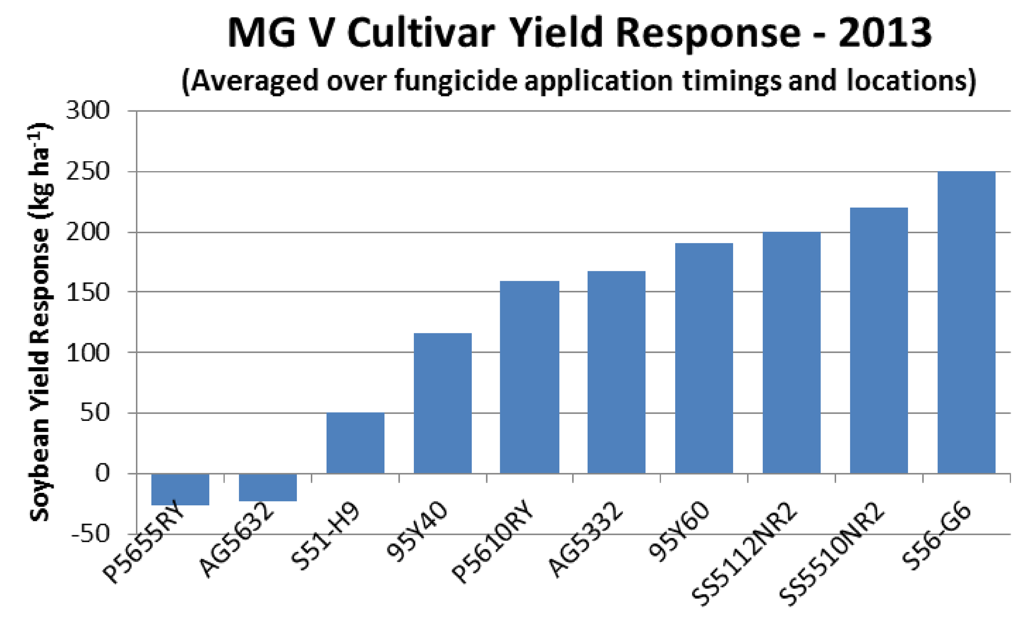
- Disease incidence was determined at R3 and R5 from 20 randomly selected leaves from each experiment.
- Beginning at R6, Cercospora blight and leaf spot severity was rated on leaves and stems at 14-day interval (stem data not presented).
- NDVI, leaf retention, and % green leaves were measured at weekly intervals after R6 (data not presented).
- Plant height and lodging was measured at R8 (data not presented).
- Plot weight, and % moisture was measured at harvest
- 100-seed weight, % purple seed stain, seed quality, and protein and oil concentration were determined (data not presented).
- Statistical Analysis
- Data were analyzed with ANOVA using PROC MIXED (SAS) to test for fixed effects and interactions; all factors were considered fixed except for replication.
- Means were separated with Fisher's LSD (P<0.05)


Fungicide Timing Results

Cultivar Results





Results & Discussion

- Canopy growth was greater than normal for double-crop systems at Painter 2012, Suffolk 2012, and Suffolk 2013 (data not shown); and therefore conducive for disease development
- Disease incidence varied with location, but Cercospora blight and leaf spot was most prevalent; other disease included downy mildew, brown spot, Phyllosticta leaf spot, frogeye leaf spot, anthracnose, & target spot.
- Disease severity varied among locations, but was generally greater in 2012 due to more rainfall during August and September of that year.
- Location interacted with cultivar and fungicide for several measurements; therefore, results are presented by location.
- Foliar fungicide application resulted in greater yields than the control in 50% of the experiments.
  - There was little difference in yield between fungicide application timings. At locations with a yield response to foliar fungicides:
    - The R5 application timing resulted in lower MG IV cultivar yields than the R3 application timing only at Warsaw in 2013.
    - The R5 application timing resulted in greater MG V cultivar yields than R3 only at Painter in 2013.
    - The R3+R5 application timing yielded more than either R3 or R5 application timing for MG V cultivars at Suffolk in 2013.
- Foliar fungicide reduced yield for MG IV cultivars at Painter in 2013.
- Cultivars generally differed in susceptibility to Cercospora blight and in leaf retention, but only MG V cultivars in 2013 differed in their yield response to fungicide.
- Cultivar did not interact with fungicide for any measurement except MG V Cercospora leaf blight ratings. The cultivar by fungicide interaction differed among locations for leaf ratings in 2013. Due to space constraints, these data are not presented.

Research supported by:

UNITED SOYBEAN BOARD
Making Your Checkoff Pay Off.
VIRGINIA SOYBEAN BOARD
Making Your Checkoff Pay Off.

In addition, funding for this work was provided in part, by the Virginia Agricultural Experiment Station and the Hatch Program of the National Institute of Food and Agriculture, U.S. Department of Agriculture.