

Optimizing fungicide application frequency and application interval relative to soybean maturity for improved white mold management in soybeans

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In soybeans of mid-zero maturity and longer, two fungicide applications are often needed for satisfactory white mold management in soybeans. Empirical data are lacking on the optimal interval between sequential fungicide applications, and this study sought to identify the number of days between applications that optimizes soybean yield.

Research conducted:

Field trials were conducted in Carrington and Oakes under overhead irrigation. Testing was conducted on soybeans of 00.9, 0.6, 0.9 and 1.1 maturity with Endura (5.5 oz/ac) applied once versus twice sequentially and with Topsin (40 fl oz/ac) applied once versus 40 fl oz Topsin followed by 5.5 oz Endura. Sequential applications 7, 10, 12 and 14 days apart were tested for each of these fungicide sequences. Applications were made in 15 gal/ac with a hand-held boom and fungicide droplet size calibrated relative to canopy closure. The first application was made at the R2 growth stage.

Why the research is important:

North Dakota producers have struggled to consistently achieve satisfactory white mold management in soybeans with fungicides.

Findings:

The optimal number of days between sequential fungicide applications was contingent on soybean maturity (Figure 1). A second fungicide application was profitable in all varieties except the 00.9-maturity variety. Yield gains from two sequential fungicide applications were maximized when applications were made 7 days apart in 0.6-maturity soybeans, 7 to 10 days apart in 0.9-maturity soybeans, and 14 days apart in 1.1-maturity soybeans. The length of the bloom period increases with soybean maturity, and delaying the second application until 14 days after the first application leaves the soybeans with relatively low levels of residual fungicide as they approach the second application but extends the period in which fungicides provide protection. This extension of protection outweighed the relatively low residual levels only in the longest-maturity soybeans which have the longest period of susceptibility to white mold.

Statistical separation between Endura (5.5 oz/ac) and Topsin (40 fl oz/ac) was not observed in any individual study, but Topsin was consistently less effective than Endura in all varieties in which white mold pressure was economically relevant. The reductions in disease control and yield were observed irrespective of whether Topsin was applied once (Figure 2) or applied as the first application in a two-application sequence (Figure 3).

Benefits/recommendations:

When making two sequential applications targeting white mold, this research suggests that the optimal interval between applications increases with soybean maturity. Follow-up research to confirm these findings is being conducted in 2022.

FIGURE 1. Yield gain conferred by a second fungicide application made 7, 10, 12, or 14 days after the first application in soybeans of 0.6, 0.9 and 1.1 maturity; Carrington and Oakes, ND (2020-21). Dots represent results from individual studies; bars represent average values. *Treatment averages followed by different letters are significantly different ($P < 0.05$).*

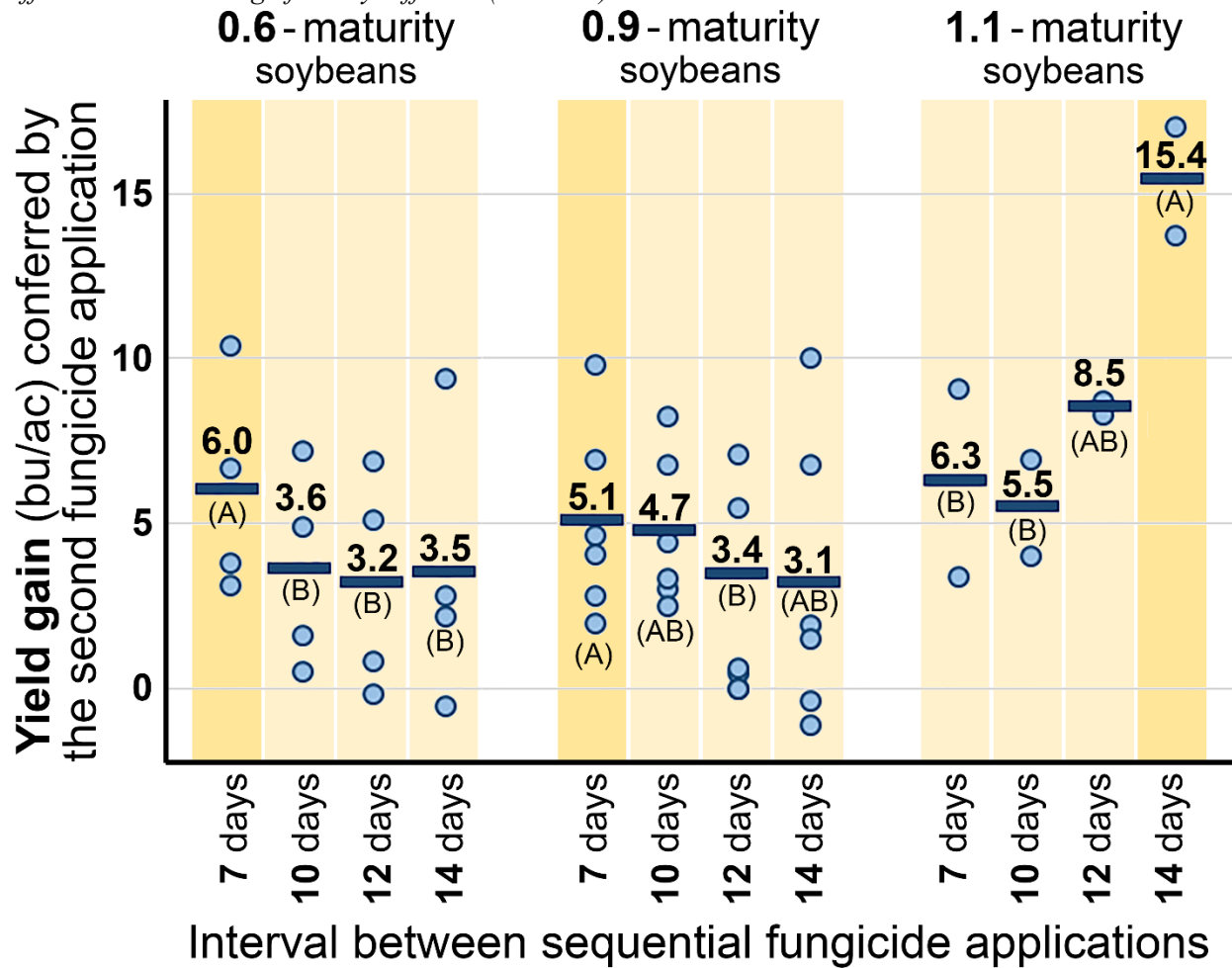


FIGURE 2. Comparative efficacy of a single application of Topsin (40 fl oz/ac) versus Endura (5.5 oz/ac) made at the R2 growth stage. The soybean canopy was at or near closure in all studies, and fungicides were applied with coarse droplets using TeeJet AIXR110015 nozzles at 50 psi. *Treatment averages followed by different letters are significantly different (P < 0.05).*

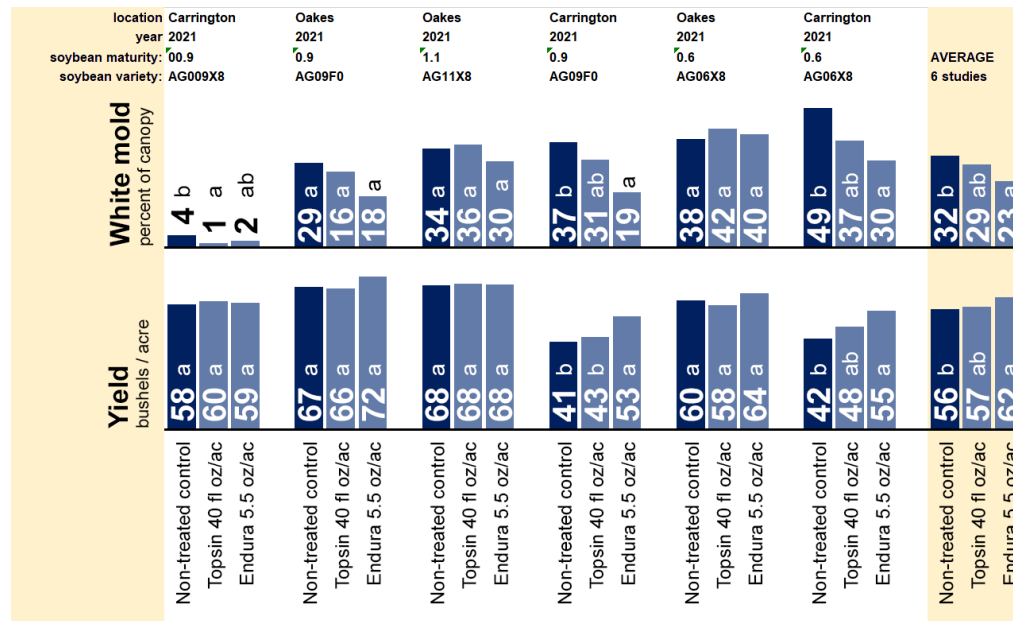


FIGURE 3. Comparative efficacy of sequential applications of Endura (5.5 oz/ac) vs. Topsin (40 fl oz/ac) followed by Endura (5.5 oz). Applications were made at the R2 growth and 7 days later (0.6-maturity and 0.9-maturity varieties) or 14 days later (1.1-maturity varieties). The soybean canopy was at or near closure in all applications, and fungicides were applied with coarse droplets using TeeJet AIXR110015 nozzles at 50 psi. *Treatment averages followed by different letters are significantly different (P < 0.05).*

