Is soybean desiccation a tool for earlier harvest and increased harvest efficiency in MN?

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Summary

This project explores the use of desiccation to achieve earlier soybean harvests and increased harvest efficiency in Minnesota. While common in the Southern U.S., desiccation is gaining interest among Minnesota farmers for reasons including earlier harvest, grain moisture management, handling uneven crops, reducing harvest losses, improving efficiency, late-season weed control, and reducing foreign material. The main goal is to control the harvest window and enhance combine speed and efficiency. However, improper desiccant application can cause significant crop damage and yield loss.

We conducted two field experiments in Waseca and Wells, MN, applying a desiccant at three different stages compared to a control treatment. The results showed that desiccation timing significantly affects grain yield and composition. Desiccation at R6 (about 20 days before maturity) caused severe yield loss (20-30%). Desiccation at R6.5 (10 days before maturity) resulted in a moderate yield reduction (5-10%). Desiccation at R7 and maturity did not affect yield. Yield loss was primarily due to a reduction in grain weight due to a reduced oil concentration that was observed in parallel with an increased protein concentration.

Our findings indicate that desiccation before R7 negatively impacts yield, with earlier applications causing more severe losses. Desiccation at R6 is unlikely to be profitable due to substantial yield losses. To avoid yield depression, desiccation should occur after maturity, though this could limit the benefits of desiccation on the harvest operations.

Introduction

There is a growing interest in looking to desiccation as a tool for an earlier soybean harvest. While this practice is quite common in the Southern U.S. where soybean maturation can be extremely problematic, there are multiple smaller factors that have caught the attention of many Northern farmers. These include: 1) earlier harvest, 2) better harvest moisture management, 3) control of uneven crops and physiological disorders, such as green stem syndrome, 4) reduced harvest losses, 5) increased harvest efficiency, 6) emergency late season weed control, and 6) reduced FM among others. Ultimately, the primary goal of this practice is to control the harvest window, while increasing combine speed and efficiency.

Desiccant application, on the other hand, can cause significant crop damage and yield loss if not managed properly. There has been some previous research on this topic mainly from southern states (Whigham and Stoller, 1979; Ratnayake and Shaw 1992; Boudreaux and Griffin, 2011; Bellaloui et al., 2021); however, there is limited information on determining the optimum time for applying the desiccant for Northern producers including those in Minnesota. Specifically, little is known regarding the earliest phenological stage in which there is no yield depression. It is important to generate local information to define the effect of the timing of the desiccation on yield. This project was proposed to assess the effect of desiccation timing on soybean yield and quality. The questions to address are: How early can soybean be desiccated without affecting yield? and, how does desiccation affect grain composition and quality?

Results

We conducted 2 controlled field experiments at Waseca and Wells, Minnesota. Crops were managed for maximum yields using best management practices. A desiccant (Sharpen® at the labeled rate) was sprayed at three different stages and compared against a control without the desiccant treatment. Grain yield, yield components and grain composition were assessed between treatments.

The timing of desiccation consistently affected grain yield in both locations (Figure 1). Desiccation of the crop close to R6 (early grain filling) approx. 20 days before maturity, severely depressed yield, and yield loss was between 20 and 30%. When desiccation took place later at R6.5 (mid grain filling) approx. 10 days before maturity, there still was a reduction in grain yield but it was of a lower magnitude. Yield loss was between 5 and 10%. Lastly, the desiccation of the crop close to R7 (physiological maturity) stage did not affect yield. As expected, the effect on yield was explained by a variation in the seed size, or weight per grain (Figure 2).

The timing of desiccation also affected grain composition in both locations (Figure 3). In general, when yield was reduced a trend was observed for a reduction in grain oil concentration. This reduction in oil concentration led to an increase in protein concentration (Figure 3).

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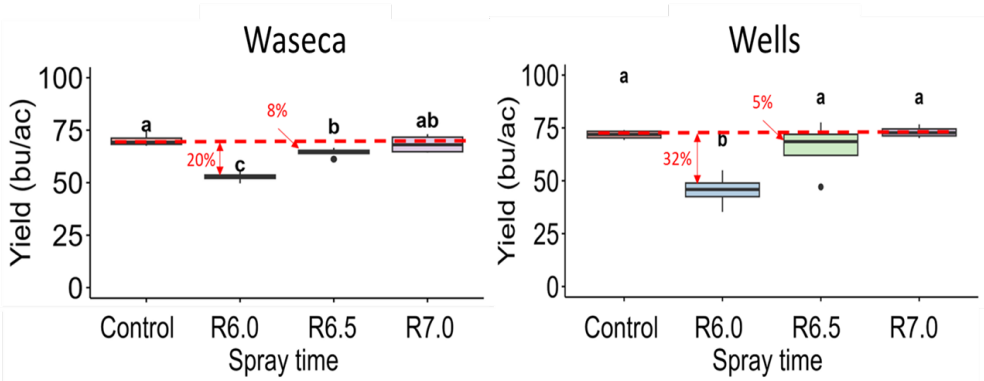

Figure 1: Soybean grain yield for three different desiccation moments and a control without desiccation at Waseca and Wells, MN, during the 2023 season.

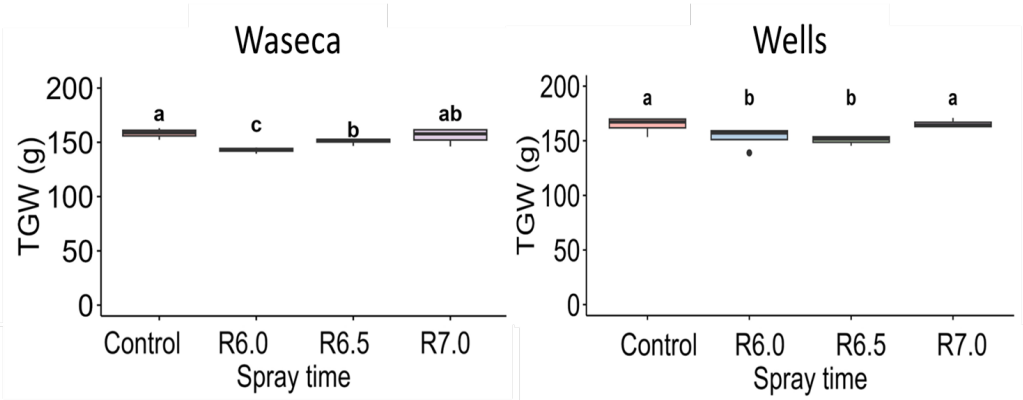

Figure 2: Soybean thousand grain weight (TGW) for three different desiccation moments and a control without desiccation at Waseca and Wells, MN, during the 2023 season.

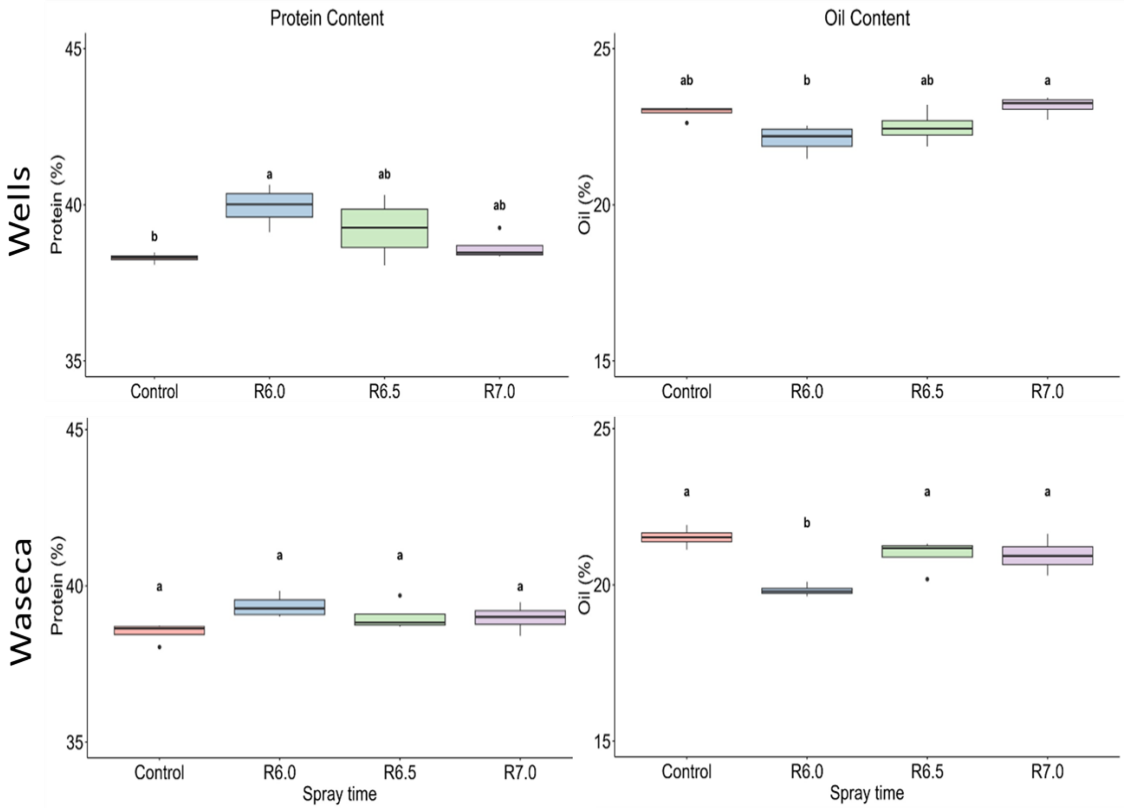

Figure 3: Soybean grain protein and oil concentration (%) for three different desiccation moments and a control without desiccation at Waseca and Wells, MN, during the 2023 season.

Conclusion

The main objective of this project was to assess the impact of desiccation timing on soybean yield for Minnesota field conditions. The data generated indicated that timing is a relevant aspect to consider when adopting this technology because of a severe impact on yield and grain quality. Overall, our results indicate that desiccation before R7 (physiological maturity) would affect yield, and that earlier applications lead to greater yield depression. Based on our data it seems that a desiccation around R6 is unlikely to be profitable under any circumstance due to substantial yield losses (up to 30%). Desiccation between R6.5 and maturity still would result in some yield reduction, but it might be possible for these yield losses to be offset by the benefits of the practice under certain circumstances. To avoid yield depression, desiccation should take place after maturity, although this would minimize the intended benefits on the harvest operation that are pursued by this technology. The next step is to quantify one potential benefit by determining how many days harvest can be advanced if desiccation occurs at R7 under Minnesota typical conditions.