Soybean Row Spacing and Seeding Rates for Optimizing Soybean Performance under Sclerotinia Disease Pressure

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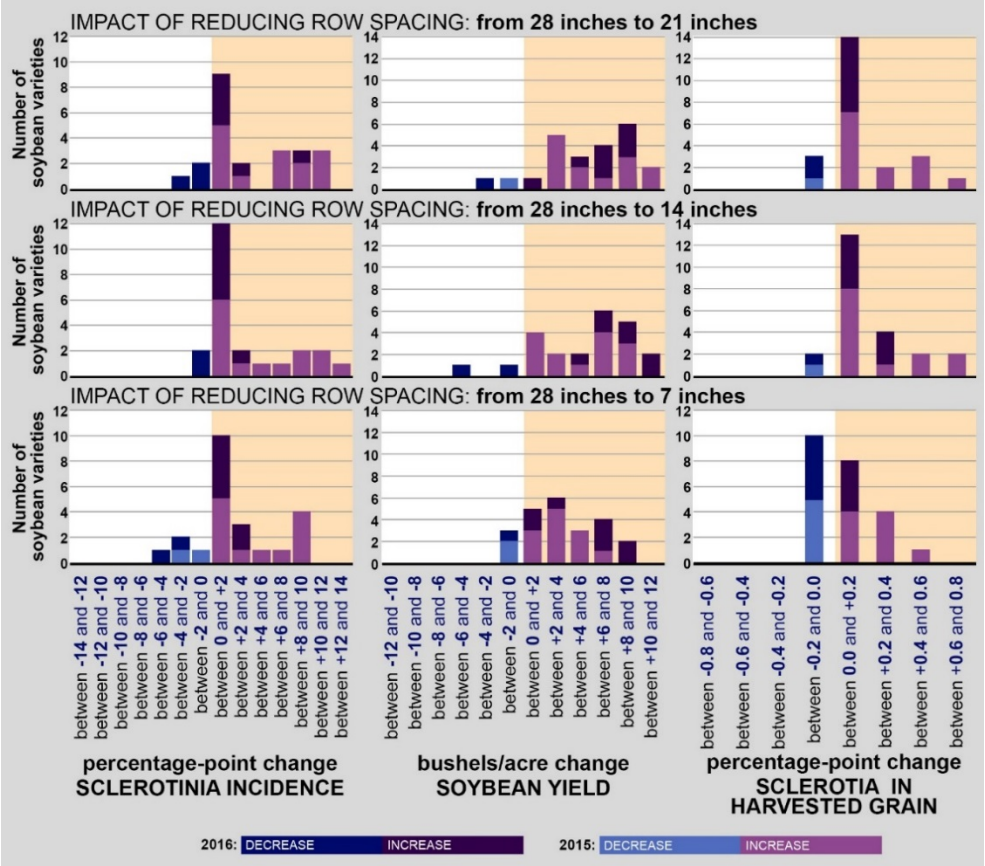
The adoption of wide row spacing (30 inches) is often one of the first changes considered after a Sclerotinia stem rot (white mold) outbreak, but wide row spacing can increase weed pressure and is associated with reduced yield potential in the absence of Sclerotinia stem rot. While the use of wide row spacing (generally 30 inches) is an effective strategy for reducing Sclerotinia, it remains unclear whether this strategy optimizes soybean yields under conditions favorable for Sclerotinia.

Previous studies suggest that the use of wide rows may not always optimize soybean yield even when Sclerotinia disease pressure is high; in two of three previous studies evaluating the impact of row spacing on Sclerotinia, soybean yields were maximized in narrow and intermediate row spacings even under high white mold disease pressure. However, the studies had critical flaws. In two studies, seeding rates were sharply increased as row spacing narrowed, making it impossible to separate the impact of row spacing from seeding rate, and, in the third study, only narrow (7.5-inch) versus wide (30-inch) rows were evaluated. None of the studies assessed the impact of row spacing and seeding rate on contamination of grain with sclerotia, which can affect soybean grade.
This project seeks to develop rigorous, yield-maximizing soybean row spacing and seeding rate recommendations for fields where Sclerotinia stem rot is a problem. Soybean agronomic performance under Sclerotinia disease pressure was evaluated at each of four row spacings (7, 14, 21, and 28 inches) seeded to each of three seeding rates (132,000; 165,000; and 198,000 pure live seeds/ac) on 14 soybean varieties across three locations across North Dakota in 2015 and on nine soybean varieties across three locations in 2016.

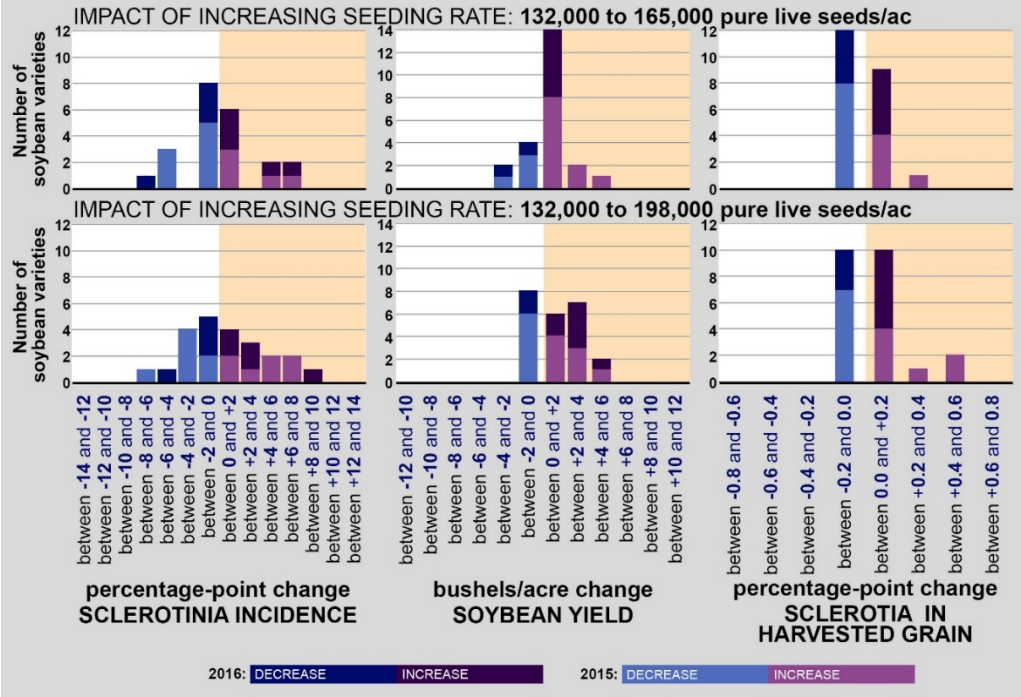
Findings from the first two years of this three-year study confirm that wide row spacing reduces Sclerotinia and reduces contamination of grain with sclerotia but indicate that soybean yield is often maximized in narrow and intermediate rows even under high Sclerotinia disease pressure. Reducing soybean row spacing from 28 to 21 inches resulted in increased soybean yields in 8 of 9 soybean varieties evaluated in 2016 and in 13 of 14 soybean varieties evaluated in 2015 despite higher levels of disease in the narrower rows (Figure 1). Similar results were observed when row spacing was narrowed from 28 to 14 inches and from 28 to 7 inches (Figure 1). The penalty for the increased yields was increased sclerotia in the grain (Figure 1). When soybeans were seeded to 28-inch rows, 17% of the varieties assessed across sites in 2015 and 2016 failed to meet the criteria for U.S. Grade #1 due to foreign material in excess of 1.0%; when soybeans were seeded to narrower rows, the frequency with which soybean varieties did not meet the criteria for U.S. Grade #1 increased to 22% (14-inch rows) or 26% (7- and 21-inch rows). However, the disease impacted soybean grade only under high disease pressure; failure to meet U.S. Grade #1 was generally only observed when Sclerotinia incidence exceeded 45 to 50%.

Figure 1. Frequency of observing increased or decreased Sclerotinia incidence, soybean yield, and sclerotia contaminants in grain as row spacing narrowed; bars denote the number of soybean varieties exhibiting different magnitudes of responses. *Dark shading within bars represent results from 2016; light shading within bars represent results from 2015. Data are from field trials conducted in Carrington (2015), Hofflund (2016), and Langdon and Oakes (2015 and 2016) with varieties of appropriate maturity tested at each location.*



Within the range of seeding rates typically utilized in North Dakota, modifying seeding rate may have only a modest impact on Sclerotinia stem rot in soybeans. When seeding rate increased from 132,000 to 198,000 pure live seeds/ac, increased Sclerotinia incidence and sclerotia contamination of the grain were more frequently observed than decreased disease and sclerotia (Figure 2), but the differences were modest. When seeding rate increased from 132,000 to 165,000, the frequencies of observing increased versus decreased disease and sclerotia contamination were approximately equal (Figure 2). Higher seeding rates were generally associated with modest increases in yield.

Figure 2. Frequency of observing increased or decreased Sclerotinia incidence, soybean yield, and sclerotia contaminants in grain as seeding rate increased; bars denote the number of soybean varieties exhibiting different magnitudes of responses. *Dark shading within bars represent results from 2016; light shading within bars represent results from 2015. Data are from field trials conducted in Carrington (2015), Hofflund (2016), and Langdon and Oakes (2015 and 2016) with varieties of appropriate maturity tested at each location.*



Final recommendations will not be developed until a third year of field trials is completed in 2017, but the preliminary results strongly suggest that seeding soybeans to wide rows may generally not be optimal even when under Sclerotinia disease pressure. The strong yield responses associated with adopting intermediate or narrow row spacing observed in this study may be associated with the environmental conditions that favor Sclerotinia disease development. Sclerotinia is most severe when moisture is not limiting during late vegetative growth and bloom, the same growth stages at which differences in sunlight capture associated with seeding soybeans to narrow, intermediate, or wide rows are expected to be most significant for determining yield potential.