

Late-Season Nitrogen Fertilizer Application in Soybean

G. Balboa, D. Hodgins, and I.A. Ciampitti

Summary

Field experiments were conducted at the North Central Kansas Experiment Field near Scandia, KS, in the summer of 2014 to evaluate effect of late-season nitrogen (N) fertilizer application on modern soybean genotypes under dryland and irrigated environments. The main objective was to determine if the N application late in the season has an agronomical benefit to soybean producers. A unique fertilizer N source (urea) was applied at five N rates (0, 40, 80, 120, and 160 lb N/a) to soybean at the R3 growth stage. Overall soybean yields under dryland conditions ranged from 73 to 89 bu/a, whereas yield variation in the irrigated environment was narrowed and ranged from 90 to 99 bu/a. Application of late-season N fertilizer did not significantly increase soybean yields either under full irrigation or in the dryland environment. Under irrigation, maximum soybean yield was documented at 99 bu/a with the 0-N fertilizer rate, whereas dryland soybean yield was maximized at 89 bu/a with 120 lb N/a.

Introduction

Increasing soybean yields is associated with larger N demand. The ability to sustain N fixation by the rhizobia during the late season can be compromised, restricting the capability of the crop to supply all of the N required for optimum grain-filling and final grain N content. Previous studies investigating the effects of late-season N fertilizer application have shown very different outcomes. A common pattern is to report fertilizer N responses in sites where average soybean yields are above 50 to 60 bu/a. Therefore, the effect of extra N application late during the crop growing season might be an important factor to consider in high-yielding soybean systems.

Procedures

For both scenarios (dryland and irrigated), the soybean variety was Pioneer 39T67 planted on May 20 in 30-in. rows at a population of 140,000 seeds/a, with no fertilizer applied before planting. For the irrigated environment, the soil type was minimal crete, whereas the dryland site soil type was a crete. Fertilizer N rates were applied at 0, 40, 80, 120, and 160 lb/a. Each fertilizer treatment was replicated four times, providing a total of 20 plots per experiment. Plot size was 10 ft (4 rows) × 50 ft. Fertilizer N was applied close to the R3 growth stage (August 15). The soybean was harvested on October 15.

Results

Late-season N fertilizer application did not statistically increase soybean yields in either water environment (irrigated or dryland) (Table 1). Overall yield level at the Scandia irrigated environment was 96 bu/a, whereas dryland yield was 83 bu/a. In these environments, the application of extra N late in the season did not increase soybean yields over the no-N application check (0-N) treatment. For Scandia dryland, the largest fertilizer N application of 160 lb/a did statistically decrease soybean yields (73 bu/a) compared with the rest of the treatments.

Application of late-season N fertilizer produced no significant improvement in grain protein, but an increasing trend in grain protein was documented as the N application increased from the check (0-N) to the highest fertilizer N rate (120-N), in both dryland and irrigated systems (from 34.2 to 35.0 in dryland, and from 34.6 to 35.2 in irrigated).

Table 1. Yield and grain protein for the late-application nitrogen (N) soybean research trial at Scandia, North Central Kansas Experiment Field, 2014

N rates, lb/a	Scandia			
	Yields at 13% moisture, bu/a		Grain protein, %	
	Dryland	Irrigated	Dryland	Irrigated
0	80.9 a ¹	98.9	34.2	34.6
40	85.4 a	90.4	34.5	34.5
80	85.8 a	93.5	34.5	34.9
120	88.9 a	98.7	34.8	34.5
160	73.3 b	96.4	35.0	35.2
<i>P</i> > 0.05	*	NS ²	NS	NS

¹ Values with the same letters are not significantly different (*P* > 0.05).

² Not significant, *P* > 0.05.