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Late-planted Soybeans Respond to Nitrogen Starter

Cultivars are compared with varying responses to applied starters at low-N sites. Future studies will focus more on optimum N rates.

Summary: *Nitrogen (N) starter applications increased grain yield an average of 2.2 bu/A, suggesting that starter N is a viable input for late-planted, double-cropped soybeans. Our results also suggest that an indeterminate growth habit may be superior to determinate types for ultra-late planting dates. Although N starter applications in these systems appear warranted, we have not pinpointed a nitrogen rate expected to promote maximum economic and/or agronomic yield. Future efforts should focus on determining appropriate starter N rates in late-planted, double-cropped soybean systems across a variety of environments.*

Recent estimates show that up to half the U.S. soybean crop is double-cropped. In the Deep South, it is becoming more common to find soybeans grown behind full-season corn. In this cropping system, planting date is delayed to mid-or-late-July from the optimal mid-May-though-late-June period. Because of this delay in planting, yield reduction is commonly associated with double-cropping. Previous studies report that yield reduction in late-planted, double-cropped soybeans is associated with a lack of sufficient vegetative growth.

Results of comparing the performance of determinate and indeterminate soybean cultivars in late-planted environments have been varied. Determinate types have produced high yields in some studies while other studies have shown indeterminate types to be superior.

Although soybeans obtain N through symbiotic fixation, application of N as a starter has produced increased vegetative growth and grain yield in numerous studies. Additional studies have shown N starter to be viable where late planting occurs. Sufficient research, however, has not been conducted in a single study in the southeastern U.S. to evaluate the combined effects of growth habit and N rate on late-planted, double-cropped soybeans.

Our objective in this study was to determine the interactive effects of N starter (0 and 45lbs/A of N) on soybean growth and yield when following corn in a late-planted, double-cropped system.

Yield

N starter increased grain yield 9 percent when averaged across all environments. As shown in Figure 1, yield was affected by both cultivar and rate of application. Au86-2397I (indeterminate) was superior to Au86-2397D (determinate) across all environments, averaging 29.1 bu/A compared with 26.7 bu/A for Au86-2397D. Greatest increase came in the highest-yielding environment (WGS96), where application of N starter boosted grain yield from 32.4 to 36.7 bu/A (data not shown). Our highest yielding environments were those receiving supplemental water sources, and those receiving rainfall within 24 hours of N application.

Early-season growth

Plant height at R1 was increased by application of N starter. Averaged across cultivars, starter application resulted in R1 plant heights of 15 inches, while plants not receiving starter averaged 13 inches. Cultivar selected affected plant height at R1. The Cook cultivar had greater height

than either Au86-2397D or Au86-2397I at R1 when averaged across N rates.

Dry matter. Both Au86-2397D and Au86-2397I exhibited increased plant dry matter yield with N starter, whereas Cook did not. It would appear dry matter response to the N starter at R1 stage was dependent on growth habit and cultivar.

N concentration. Above-ground plant N concentration at R1 increased 5 percent when N starter was applied. Moreover, reduced nodulation owing to N starter had no negative effect on total plant N concentration at the R1 stage of growth. Cultivar selected had no effect on plant N concentration.

Late-season

Maturity date was not affected by cultivar selected or starter N rate applied (data not shown).

Plant height. Au86-2397I had greater height than Au86-2397D at R8. Averaged across N rates, Au86-2397I measured 27 inches while Au86-2397D measured 18 inches, only a 4-inch increase following R1. Application of N starter slightly increased R8 plant height.

Lodging. Although there were statistical differences in plant lodging scores due to cultivar selected, there was little or no lodging (data not shown). Relatively short plant height (<22 inches) kept lodging scores minimal. Only when plant height exceeded 24 inches did we see increased lodging.

Methodology

Site. Experiments were conducted in seven southern Alabama site-year environments in 1995-96.

Design was a randomized complete block consisting of six treatments, with four replications in each environment.

P and K fertilizers were applied according to Auburn University Soil Testing Laboratory recommendations prior to planting of corn in early March.

Planting. Soybeans were planted during July in 6-inch rows at the seeding rate of 530,000 seeds/A.

Pesticides. Herbicides were applied for weed control after planting. All sites received additional postemergence applications of herbicides and insecticides for control of specific pests.

Climate. Growing-season precipitation was within normal limits, and supplemental overhead irrigation was applied according to standard practice.

Sampling. Prior to soybean planting, soil samples were taken. Root and plant samples were taken at the R1 developmental stage.

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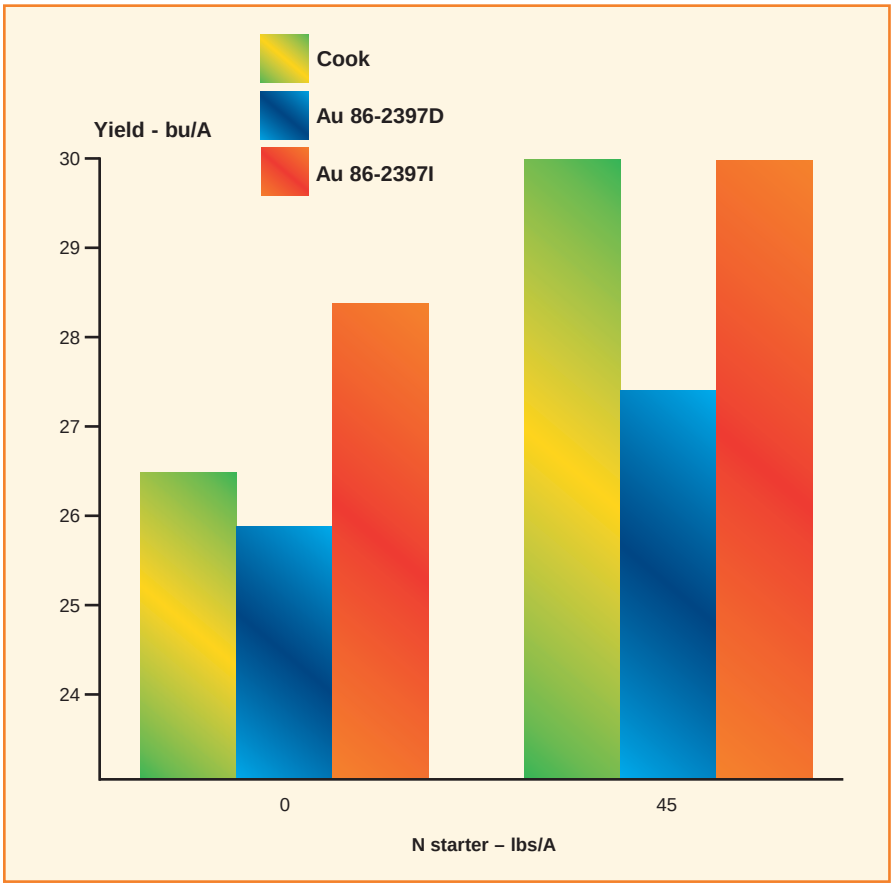

Figure 1. Yield effects of N starter and cultivar on R8 developmental stage traits of late-planted soybeans in southern Alabama, 1995-96.