

Soybean Response to Intensive Management, Carrington, 2009

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An irrigated trial was conducted at the NDSU Carrington Research Extension Center to examine soybean seed yield and quality based on individual or combinations of selected management inputs that may increase net return for producers. Experimental design was a randomized complete block with split plot arrangement with four replications. Whole plots were row spacing (14 and 28 inches) and split plots consisted of a factorial combination of cultivars, planting rate (150,000 and 200,000 pure live seeds/A), and foliar inputs versus untreated check. The conventional-till study was established with spring wheat as the previous crop on a Heimdal-Emrick loam soil with 75 lb/A (0-24") nitrate-N, 25 ppm P, 166 ppm K, 4.1% organic matter and 7.3 pH. Secondary and micro nutrients were at medium to high soil levels. Inoculated Croplan cultivars 'RT0268' and 'RT0669' were planted on May 22. Foliar treatments were applied with a CO₂-pressurized hand-boom sprayer delivering 14 gal/A at 35 psi with 8001 flat-fan nozzles. The V2-3 growth stage treatments (TJ Technologies 'Sunflower/Canola/Soybean Mix' at 48 fl oz/A plus an experimental EMD Crop BioScience 'LCO promoter' at 4 fl oz/A) were applied on July 2 and R3 growth stage treatment (Headline fungicide at 6 fl oz/A + NIS at 0.125% v/v) was applied on July 28 to 'RT0669' and August 2 to 'RT0268'. Plant disease was evaluated but notes were not taken due to very low incidence. Rainfall totaled 7.3 inches (NDAWN) from June 1 to September 30, plus center-pivot irrigation totaling 4.5 inches. The trial was harvested with a plot combine on October 13.

The 14-inch row spacing provided canopy closure 32 days earlier compared to the wide rows (Table 1). Seed yield was similar between row spacings while seed size was larger with the wide rows. The 150,000 pls/acre planting rate resulted in an average stand of 151,900 plants/acre and the 200,000 pls/acre planting rate resulted in an average stand of 194,600 plants/acre. The low planting rate delayed seed maturity by one day. The high planting rate resulted in a seed yield advantage of 3.8 bushels/acre. Yield tended to be higher with use of the foliar inputs.

Economic analysis was applied to main factors that had statistical yield differences. Assumptions include soybean market price of \$9/bushel, seed costs of \$40/50 lb unit (low) and \$70/140,000 seeds (high), and seed count of 2800/lb and germination of 95%. Among the factors of row spacing, planting rate, and special foliar inputs, the high planting rate provided a yield advantage of 3.8 bushels/acre compared to the low rate. The yield increase with the high planting rate provides a net return of about \$20/acre using the low seed costs and \$9.50/acre using the high seed costs.

Analysis of variance (AOV) P values with statistical significance (LSD 0.05) for main factors and interactions are identified in Table 2. Factor interactions will be discussed at completion of the three-year study.

| Table 1. Soybean response to main factors in intensive management study, CREC, 2009. | | | | | | | | | | | | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------|--------|----------------|-----------|-----------------|--------|-------|------------|-------|-------------|------------|------|---------|
| Main factor | Sub factor | Plant | | | | | | | | Seed | | | | |
| | | Emergence | Stand | Canopy closure | Flowering | PM ¹ | Height | Lodge | Pod height | Yield | Test weight | Number /lb | Oil | Protein |
| | | Jday ² | plt/A | Jday | | | inches | 0-9 | cm | bu/A | lb/bu | | % | % |
| Variety | RT0268 | 155 | 176914 | 226 | 202 | 269 | 80 | 0.5 | 3.2 | 48.1 | 57.3 | 2821 | 18.4 | 39.4 |
| | RT0669 | 155 | 169003 | 222 | 191 | 263 | 95 | 0.3 | 3.5 | 58.8 | 56.6 | 3083 | 18.8 | 38.6 |
| Row spacing (inches) | 14 | 154 | 185510 | 213 | 197 | 266 | 89 | 0.5 | 3.4 | 53.7 | 56.9 | 3059 | 18.6 | 38.9 |
| | 28 | 155 | 158972 | 245 | 197 | 267 | 86 | 0.3 | 3.3 | 53.4 | 57 | 2839 | 18.5 | 39.1 |
| Planting rate (x1000 pls/acre) | 150 | 155 | 151929 | 226 | 197 | 267 | 88 | 0.4 | 3.4 | 51.7 | 57.0 | 2924 | 18.6 | 39.0 |
| | 200 | 155 | 194558 | 224 | 197 | 266 | 88 | 0.4 | 3.4 | 55.5 | 56.9 | 2986 | 18.5 | 39.0 |
| Special inputs ³ | Foliar | 155 | 169921 | 225 | 197 | 267 | 88 | 0.4 | 3.4 | 54.3 | 57.0 | 2932 | 18.6 | 39.0 |
| | UTC | 155 | 175965 | 224 | 196 | 266 | 88 | 0.4 | 3.4 | 52.8 | 56.9 | 2978 | 18.6 | 39.0 |
| Mean | | 155 | 172894 | 225 | 197 | 266 | 88 | 0.5 | 3.5 | 53.6 | 56.9 | 2954 | 18.6 | 39.0 |
| CV % | | 0.3 | 18.5 | 3 | 0.4 | 0.7 | 4.1 | 93.6 | 32.7 | 13.7 | 0.7 | 3.2 | 1.2 | 0.9 |
| LSD (0.05): highlighted pairs of data = significantly different. | | | | | | | | | | | | | | |
| ¹ PM = physiological maturity. | | | | | | | | | | | | | | |
| ² Jday = Julian calendar. | | | | | | | | | | | | | | |
| ³ Foliar = V2 stage application of micro-nutrient blend + LCO promoter; followed by R2 application of Headline fungicide; UTC = untreated check. | | | | | | | | | | | | | | |

| Table 2. AOV P values of factor interactions for soybean intensive management study, CREC, 2009 ¹ . | | | | | | | | | | | | | | |
|----------------------------------------------------------------------------------------------------------------|-----------|-------|----------------|-----------|-----------------|--------|--------|------------|-------|-------------|------------|-----|---------|---|
| Factors ² | Plant | | | | | | | | Seed | | | | | |
| | Emergence | Stand | Canopy closure | Flowering | PM ³ | Height | Lodge | Pod height | Yield | Test weight | Number /lb | Oil | Protein | |
| | | Jday | plt/A | Jday | | | inches | | cm | bu/A | lb/bu | | % | % |
| rep | | | | | | | | | | | | | | |
| VAR | * | | * | * | * | * | * | * | * | * | * | * | * | * |
| rep*VAR | | | | | | | | | | | | | | |
| ROW | | | * | | | | | | | | * | | | |
| SEED | * | * | | | * | | | | * | | * | | | |
| MGMT | | | | * | | | | | | | | | | |
| VAR*ROW | | | | * | | | | | | | | | | |
| VAR*SEED | | * | | | | | * | | | | | | | |
| VAR*MGMT | | | | * | | | | | | | | | | |
| ROW*SEED | | | | | | | | | | | | | | |
| ROW*MGMT | | | * | * | | | | | | | | | | |
| SEED*MGMT | | | | * | | | | | | | | * | * | |
| VAR*ROW*SEED | * | | | | | | | | | | | | | |
| VAR*ROW*MGMT | | | * | * | | * | | | * | | | | | |
| VAR*SEED*MGMT | | | | * | | | | | | | | | | |
| ROW*SEED*MGMT | | | | | | | | | | | | | | |
| ¹ * = statistically significant using LSD 0.05. | | | | | | | | | | | | | | |
| ² VAR = varieties; ROW = row spacings; SEED = planting rates; and MGMT = special foliar inputs. | | | | | | | | | | | | | | |
| ³ PM = physiological maturity. | | | | | | | | | | | | | | |