**Technical Report**

**Seeding Date and Cultivar Influence on Soybean Performance in Northeastern North Dakota - 2018**

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**Objectives:**

**1.** Improve soybean performance for North Dakota producers in the northern counties of northeast North Dakota by determining the relationship between cultivar maturity and seeding date on soybean yield and agronomic traits.

**2.** To provide RMA (Risk Management Agency) and crop insurance agents data on the effects of replanting past the final planting date (June 10) on yield and quality of soybeans in the northern most counties of northeast North Dakota.

**Methodology**

The experimental field design was a randomized complete block in a split-plot arrangement with four replications. Soil type was a Svea-Barnes loam. Soil tests indicated 22 lbs N/a, 13 ppm P, 283 ppm K, pH 6.7, OM% 4.4 and EC 0.38 and 0.55 mmho/cm soluble salts (0-6” and 6-24”). An additional 25 lbs N/a, 39 lbs P/a and 20 lbs S/a were applied. Three Roundup Ready cultivars with maturity groups (MG) of 00.5, 00.9 and 0.1 were seeded on May 15, May 24, June 4, June 14, and June 25. An established population density of 180,000 plants/a was the target. Plot size was 3.5’ x 21’ with seven six-inch rows. Net Return $/a = yield x $7.50 bu/a.

**Results**

Rainfall totaled 11.63 inches during April to September, 2.68 inches below normal, with most of that received in June until mid-July. Temperatures were 6.8 degrees F. above normal in May and June, near normal in July and August and 2.9 degrees F. below normal in September. Cultivars seeded on June 25 did not mature prior to the first killing freeze on September 29. Only height of 1st pod (pod height) and plant height data are reported for all seeding dates.

The analysis of variance (p>F) is reported in Table 1. Statistically significant seeding date by cultivar interactions occurred for the agronomic traits days to mature, percent oil concentration and test weight but differences were considered not to have agronomic importance. Only means averaged over cultivars and seeding dates are examined (Table 2). There were no significant difference in plant stands for seeding dates or cultivars (data not shown). Plant and pod height decreased with later seeding dates with the 0.1 cultivar having the greatest height. The number of days to mature decreased with later seeding dates while days to mature increased with later MG. No significant differences were observed among seeding dates for percent grain protein while oil content decreased at later seeding dates. Test weights were highest at the June 4 seeding date with the 0.1 MG having the lowest test weight mainly because of a significant drop at the June 14 seeding date (data no shown).

There were significant interactions between seeding date and cultivar MG for yield and net return $/a. Yields were greatest at the earliest seeding date and decreased at each of the later subsequent dates (Figure 1). Maturity group cultivars 0.1 and 00.9 had higher yields at the May 15 and May 24 seeding date, but at the June 14 seeding date the MG 00.5 cultivar had the highest yield. The yield difference between the May 15 and June 14 seeding dates for the 00.5, 00.9 and 0.1 cultivars were 13.6, 21.4, and 23.7 bu/a, respectively. Net return $/a results followed the same trends as yield (Figure. 2).

**Table 1. Soybean seeding date and cultivar analysis of variance (p>F)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Effects | PlantStand | PlantHeight | PodHeight | Day toMature(R8) | GrainProtein | Oil | 1000KWT | TestWt. | Yield | NetReturn |
| Date (D) | .1368 | <.0001 | .0008 | <.0001 | .0132 | <.0001 | .0711 | .0002 | <.0001 | <.0001 |
| Cultivar (C) | .2107 | <.0001 | .0083 | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 | .0111 | .0117 |
| D x C | .7499 | .3496 | .8966 | .0282 | .1760 | .0002 | .2582 | <.0001 | .0207 | .0210 |
| CV% | 15.9 | 6.1 | 15.9 | 0.9 | 1.3 | 1.6 | 4.6 | 1.1 | 5.7 | 5.7 |

**Table 2. Seeding date effects on various agronomic traits averaged over cultivar maturity group.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Seeding | Plant | Pod | Days to | Grain |  | 1000 | Test |
| Date | Height | Height | Mature3 | Protein | Oil | KWT | Weight |
|  | inches | inches | DAP1 | % | % | g | lbs/bu |
| May 15 | 31 | 4.6 | 102 | 32.8 | 15.9 | 181 | 54.3 |
| May 24 | 29 | 5.1 | 100 | 32.5 | 15.8 | 176 | 54.8 |
| June 4 | 30 | 5.1 | 98 | 32.3 | 14.4 | 171 | 56.2 |
| June14 | 27 | 3.8 | 91 | 31.7 | 14.0 | 179 | 54.3 |
| June 25 | 23 | 3.6 | --2 | -- | -- | -- | -- |
| Mean | 28 | 4.4 | 97 | 32.3 | 15.1 | 177 | 54.9 |
| LSD 5% | 1.4 | 0.6 | 0.5 | NS | 0.2 | NS | 0.5 |

**Cultivar maturity group effect on various agronomic traits averaged over seeding dates.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Cultivar | Plant | Pod | Days to | Grain |  | 1000 | Test |
| Maturity | Height | Height | Mature3 | Protein | Oil | KWT | Weight |
| Group | inches | inches | DAP1 | % | % | g | lbs/bu |
| 00.5 | 26 | 4.0 | 94 | 31.7 | 15.4 | 167 | 55.6 |
| 00.9 | 28 | 4.5 | 97 | 32.2 | 15.2 | 174 | 54.9 |
| 0.1 | 30 | 4.7 | 102 | 33.1 | 14.6 | 190 | 54.3 |
| LSD 5% | 1.1 | 0.5 | 0.5 | 0.3 | 1.7 | 6.0 | 0.4 |

*1Days after planting. 2Cultivars seeded on June 25 did not mature prior to the first killing freeze.*

*3Growth stage R8 – 95% brown pod.*

 **Figure 1. Seeding date and cultivar maturity group effect on soybean yield.**

 **Figure 2. Seeding date and cultivar maturity group effect on net return $/a**

**Benefits to the North Dakota soybean industry.**

Northeast North Dakota has seen a dramatic increase in soybean acreage in recent years. Choosing the right combination of seeding date and cultivar maturity group is an important decision producers make in obtaining optimum soybean production. Prior research on the relationship between seeding dates and cultivar maturity has been located in east central and southeast North Dakota. Developing a database for the cooler and shorter growing seasons of northeast North Dakota is critical. First year results suggest that when seeding between a mid-May to June 4 seeding date, a 00.9 or 0.1 cultivar MG resulted in higher yields and greater net return $/a, but at the June 14 seeding date an early MG 00.5 cultivar resulted in a higher yield and net return $/a. The further seeding date is delayed into June, the greater chance of a successful crop with the earliest MG. The success of the seeding the last ten days of June would be problematic with even the earliest MG and would be dependent on weather conditions and timing of the first fall freeze in any given year. This information will be valuable to producers, insurance agents and the RMA for spring seeding date and replanting decisions and will increase soybean performance and grow profits that will stimulate the local economy and enhance community sustainability.