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Soybeans unresponsive to starter N

CATEGORY **soils and fertility** | *Dec 1, 2020*

Starter nitrogen (N) up to 75 lbs. N/ac broadcast and incorporated before planting a Maturity Group 00 soybean cultivar found no differences in biomass, grain protein, or oil content. There was no yield response for treatments receiving starter N fertilizer relative to the unfertilized control over three years of research.

In short growing season soybean areas of the Prairies, it has been speculated that application of N fertilizer at planting would help supply sufficient plant available N to stimulate early season soybean growth before biological N fixation (BNF) begins. This research looked at whether increasing rates of starter N fertilizer would increase soybean growth, yield, and grain protein.

Knowing that the addition of starter N fertilizer may have a negative effect on BNF, the researchers measured the effect of starter N treatments on BNF, and evaluated the N balance from BNF, soil N, and fertilizer N to identify if there was an optimum rate for starter N fertilization in soybean.

Field experiments were conducted in 2015, 2016, and 2017 at the University of Manitoba Ian N. Morrison Research Farm, near Carman, Manitoba on an Orthic Black Chernozem soil. The six treatments were N fertilizer rates of 0, 15, 30, 45, 60, and 75 lbs. N/ac (0, 17, 34, 50, 67, and 84 kg N/ha) applied as urea that was broadcast and immediately incorporated into the soil using a harrow.

Fertilizer treatments were applied in the spring just before planting soybean. Conventional tillage was used to manage the plots.

Spring wheat was the previous crop. In 2015, the soybeans were sown into land that had not previously grown soybean. In 2016 and 2017, the fields had their first soybean crop three years ago.

Soybean varieties with a Maturity Group rating of 00 were planted on 25 May 2015, 7 June 2016, and 24 May 2017. Late planting in 2016 was due to prolonged wet soil conditions. The target soybean population of 180,000 plants/ac (444,600 plants/ha) was seeded on 15 inch (38-cm) row spacing. Soybean seed was inoculated with *Brady rhizobium* each year before planting.

Starter N not recommended

Starter N fertilizer rate had no significant effect on soybean biomass at the three growth stages sampled at R2, R5.5 and R8. At the R2 stage, an increase in N uptake relative to the control and 15 lbs. N rate only occurred at the highest N rate of 75 lbs. Nitrogen fertilizer rate had no effect on total N uptake at the R5.5 and R8 stages when averaged over the three years.

Starter N fertilizer did not increase grain protein or oil content of soybean. Soybean protein content was 34.8% averaged over all treatments and all three years. These levels may be considered low but is close to the Canadian Grain Commission's five-year average (2013–2017) of 34.5% for oilseed type soybeans.

Average oil content was higher in 2015 (17.7%) followed by 2017 (17.0%) and lowest in 2016 (16.2% g). Canada's 5-year average is 18.4%.

There were no increases in soybean yield for treatments receiving starter N fertilizer relative to the unfertilized control over the three years. In the first 2 years, there were no significant differences in yield across all fertilizer rates. In 2017, the 75 lbs. N significantly decreased yield. Yields ranged from around 45 to 56 bushels per acre (3 to 3.8 tonnes/ha).

Percent Biological Nitrogen Fixation in the N fertilized treatments was reduced in all three years relative to the control.

The results of this study do not support the use of starter N fertilizer to increase soybean yield and grain protein content in the short season growing area of the Canadian Prairies.

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