

Soybean Response to Nitrogen and Sulphur: 2016 Summary of Dalhousie Trials

Objective

The objective of this trial was to evaluate the response of soybeans to Nitrogen and Sulphur. Questions on the necessity of starter Nitrogen have been asked by many growers. In general, many growers apply some Nitrogen (25-40 kg/ha) as a preplant application with part of a blend to add recommended P & K. There is some feeling that soybeans may be lacking early N until nodulation occurs. A concern with the application of nitrogen is the effect on nodulation. When nitrogen is readily available soybeans can be less likely to form a symbiotic relationship with the Rhizobium bacteria in the soil which colonizes the roots and fixes nitrogen from the atmosphere and makes it available to the plant. The other nutrient being tested in this trial is Sulphur which is becoming a concern in all crops as soil Sulphur levels become depleted in the region. The interaction of nitrogen uptake and utilization in the plant in relation to Sulphur availability is very important.

Design and Methods

The soybean response to Nitrogen (N) and Sulphur (S) trial was carried out in 2014, 2015 and 2016 under the Atlantic Grains Council Agri-Innovation Project - Focused Research for Atlantic Grain and Oilseed Producers, Activity 6 – Soybean Field Trials. The Cereal and Oilseed research group of the Faculty of Agriculture of Dalhousie University Agricultural Campus in Truro, NS was responsible for the design, setup, seed packaging, data analysis and report preparation. Trials were carried out in all three provinces with the assistance of Agriculture and Agri-Food Canada at the Harrington, PEI site and NBDAA for the Hartland, NB site. Information for each site including base soil analysis results, plot size, seeding date, management and harvest date is presented in Table 1. Further information is available at <http://www.atlanticgrainscouncil.ca/>.

Table 1. 2016 Site Information Soybean Trials

	Truro, NS	Canning, NS	Harrington, PEI	Hartland, NB
Previous Crop	Grass Forage	Winter wheat	Barley	Corn
pH	6.5	6.5	6.2	6.4
Organic Matter (%)	2.8	2.6	2.3	5
P ₂ O ₅ (kg/ha)	1924	1691	626	823
K ₂ O (kg/ha)	384	289	292	325
S (kg/ha)	22	18		
Seeding Date	June 1 st	May 27 th	June 3 rd	June 2 nd
Seeding Rate	55 seeds/m ²	55 seeds/m ²	55 seeds/m ²	55 seeds/m ²
Cultivar	NSC Jaden RR2Y	NSC Jaden RR2Y	NSC Jaden RR2Y	NSC Jaden RR2Y
Harvest Date	Nov. 14 th	Oct. 20 th	Nov. 14 th	Oct. 4 th

Specifically, this trial is comparing the effects of four N levels of 0 to 60 kg/ha N applied as ammonium nitrate and four Sulphur levels of 0 to 30 kg/ha applied as K-Mag (Table 2).

Table 2. Soybean N & S Response Treatments

Factor A – N Level (kg/ha) Applied as AN (34-0-0)	
1	0
2	20
3	40
4	60
Factor B – Sulphur Levels (kg/ha) Applied as K-Mag(0-0-22-22)	
1	0
2	10
3	20
4	30

The trial was carried out on a small plot basis as a factorial randomized complete block design. Treatments were applied post planting by hand broadcasting the appropriate rate of fertilizer over the small plots. The 2550 HU variety, NSC Jaden RR2Y, was the variety used in this test. The test was planted at sites in Truro, NS; Canning, NS; Harrington, PEI and Hartland, NB. Data collected at all sites included plant heights, pod heights, yield, hundred seed weight, protein and oil content. Additional data including stand counts, nodule counts, root assessment and nodule assessment was collected at the NS and PEI sites. Root and nodule assessment was completed at the NB site. The 2016 season was the third year of this trial. This summary reports on trial details and summarizes the 2016 data.

Results/Conclusions

In 2016, there was a significant yield response to Nitrogen levels at the PEI and NB sites (Figure 1). There was a significant response to Sulphur at the PEI and Canning NS sites (Figure 2). No significant interaction between Nitrogen and Sulphur was found at any site. At the NB site the yield was significantly higher by at least 350 kg/ha with the application of 20, 40 or 60 kg/ha N, which did not significantly differ, than the 0 N treatment. At the PEI site yields were significantly higher at the 60 kg/ha N rates than with 0 or 20 kg/ha N but not significantly greater than the 40 kg/ha N treatment. The difference between the 0 N treatment and 60 N treatment was 337 kg/ha. At both the PEI and Canning, NS sites yields with the application of 10, 20 or 30 kg/ha S did not significantly differ from one another but were significantly higher than the treatment receiving no Sulphur (0S). The difference was at least 763 kg/ha at the PEI site but only 265 kg/ha at the Canning, NS site. At the PEI, Canning, NS and Truro NS sites where nodule counts were completed on a sample of plants the number of nodules per plant was significantly affected by rate of N application (Figure 3). At the PEI site nodule numbers decreased significantly from the 0 and 20 kg/ha N treatments to the 40 and 60 kg/ha N treatments. At the Canning, NS site the nodule number was significantly less at the 40 and 60 kg/ha N rate than the 0 N treatment but did not significantly differ from the 20 kg/ha N rate. The nodule number decreased significantly from the 0 to 20 and 40 kg/ha N and decreased significantly again at the 60 kg/ha N rate at the Truro, NS site. Sulphur applications resulted in a significant increase in nodule numbers at the PEI and Truro, NS sites. Nodule numbers at 20 or 30 kg/ha S rates were significantly higher than the 0 S treatments at the PEI site and nodule number and nodule size was significantly greater with 10, 20 or 30 kg/ha S than the 0 S treatment at the Truro, NS site. Root

mass assessment was significantly affected by S rates at the PEI site. Treatments receiving 20 or 30 kg/ha had a significantly higher visual root mass assessment than the 0 S treatment.

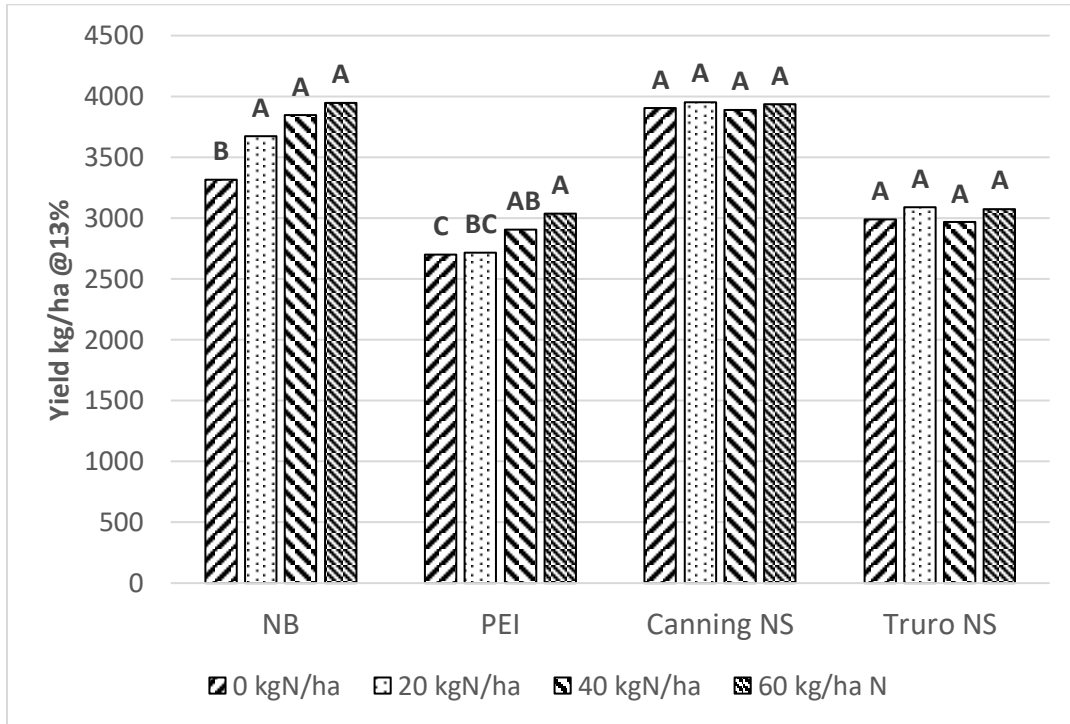


Figure 1. 2016 Soybean Yields at each N level for each Site.

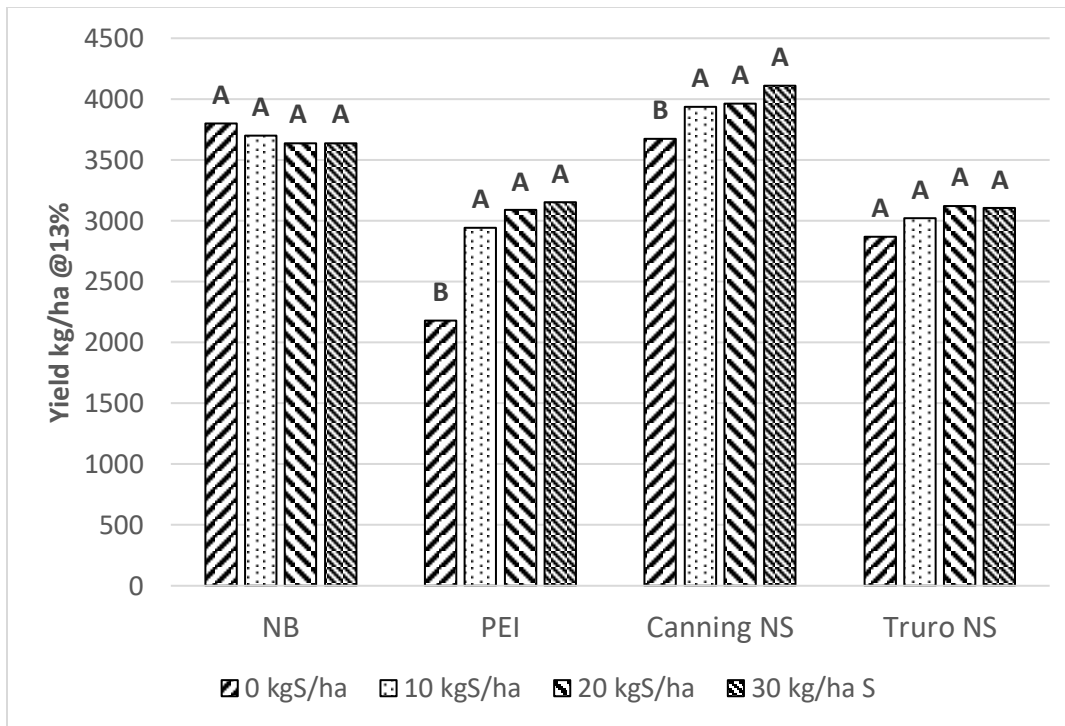


Figure 2. 2016 Soybean Yields at each S level for each site.

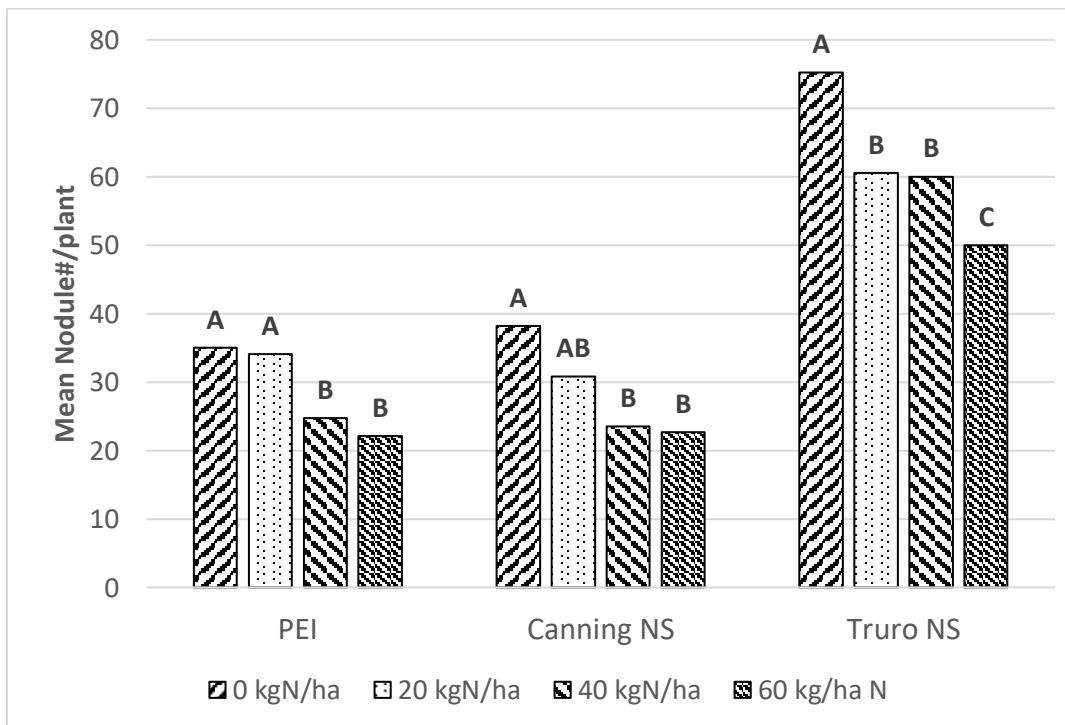


Figure 3. Soybean nodule #'s at each N level for PEI, Canning, NS and Truro, NS sites