

Does Soybean need starter Nitrogen fertilizer in Manitoba?

Navneet Brar and Yvonne Lawley

Department of Plant Science, University of Manitoba, Winnipeg, MB



UNIVERSITY
OF MANITOBA

Introduction

- In Manitoba, harvested soybean area increased by 16.3 % in 2016 from 2015 to 1.6 million acres (Stat Canada, 2016)
- Low soil temperatures that commonly occurs in Manitoba at or after soybean planting has the potential to delay emergence, nitrogen fixation and growth of soybean (Zhang and Smith, 1994)
- Addition of starter N can stimulate early vegetative growth under stressful conditions and eventually increase seed yield (Osborne and Riedell, 2006)

Objective

To investigate the effect of low rates of N fertilizer application at planting on growth and yield of soybean in Manitoba

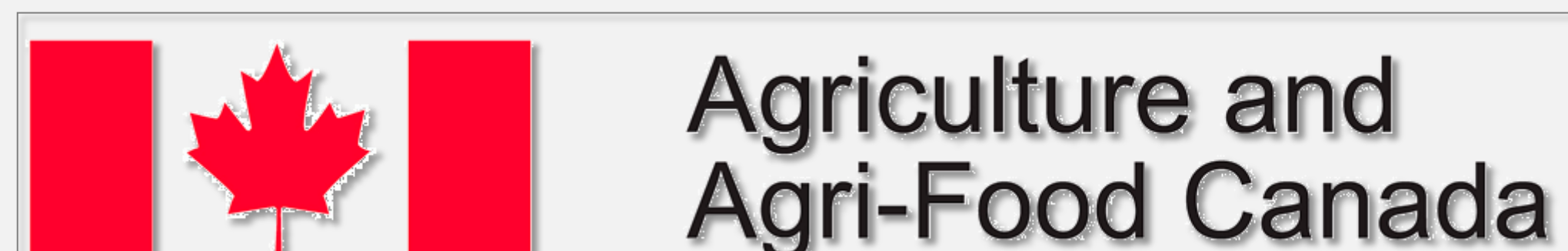
References

Osborne, S. L., & Riedell, W. E. (2006). Starter nitrogen fertilizer impact on soybean yield and quality in the Northern Great Plains. *Agronomy Journal*, 98(6), 1569-1574.

Statistics Canada. Table 001-0010 - Estimated areas, yield, production and average farm price of principal field crops, in metric units, annual CANSIM database (accessed on Oct 10, 2016)

Zhang, F., & Smith, D. L. (1994). Effects of low root zone temperatures on the early stages of symbiosis establishment between soybean [*Glycine max* (L.) Merr.] and *Bradyrhizobium japonicum*. *Journal of experimental Botany*, 45(10), 1467-1473.

Acknowledgements



Results

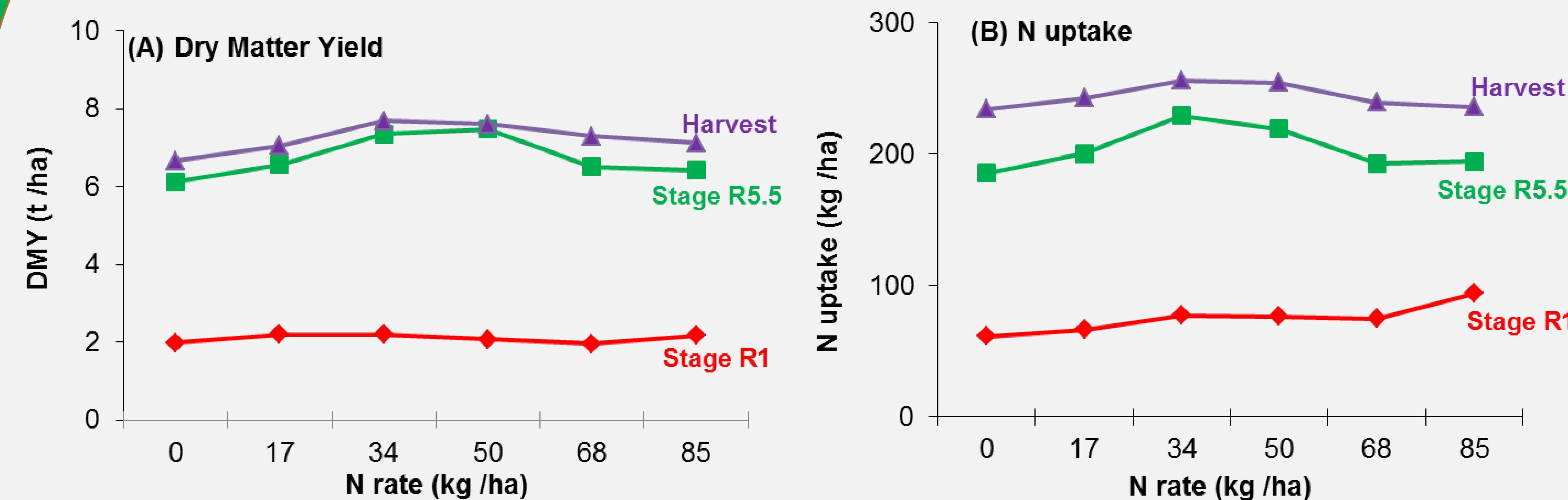


Figure 1: The effect of N fertiliser rate application at planting on soybean (A) Dry matter yield and (B) N uptake at Carman, MB in 2015.

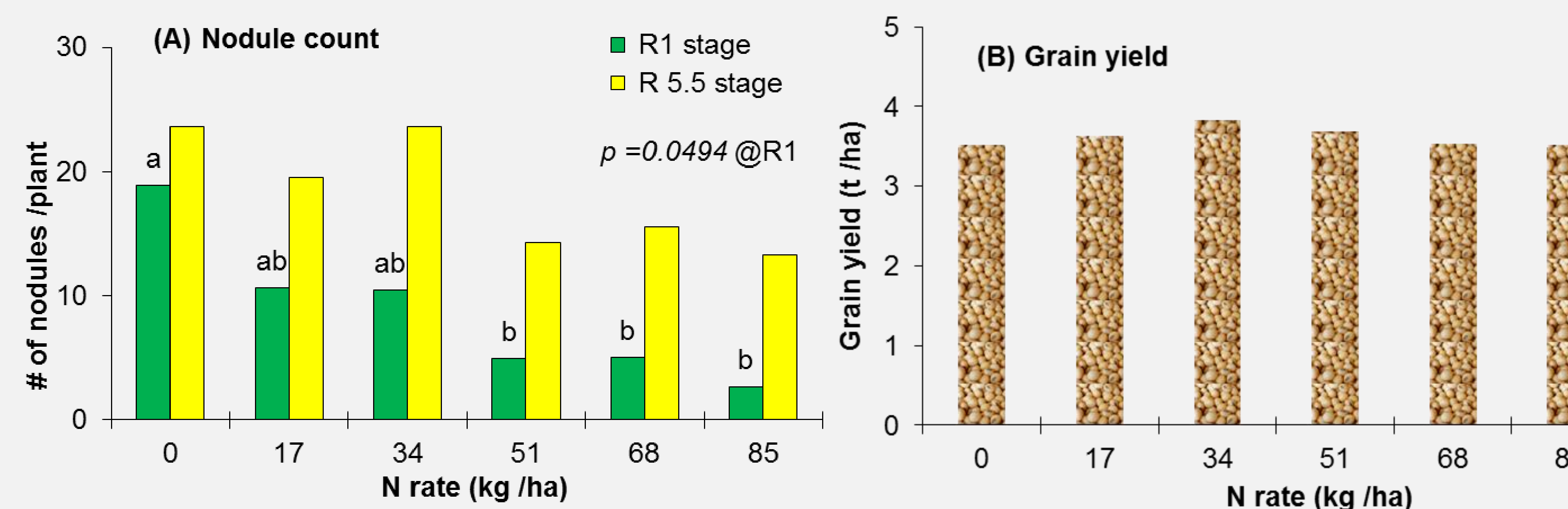


Figure 2: The effect of N fertiliser rate application at planting on soybean (A) Nodule count at both R1 (flower initiation) and R5.5 (begin seed) stages and (B) grain yield at Carman, MB in 2015.

Key Findings

- In the first year of the study, low rates of N fertilizer application at planting did not influence soybean performance. There were no statistical differences in crop biomass, N uptake, grain yield or grain quality between the N fertilizer treatments at Carman in 2015 ($p = 0.05$).
- Nodule count per plant at the R1 stage decreased significantly with increasing rates of N fertilizer ($p=0.0494$) but there were no differences at the R5.5 stage (Figure 2 A)
- To validate these findings, this experiment will be repeated in 2016 and 2017. A plan to examine the impact of N fertilizer application rates on soybean N fixation is ongoing

Materials and Methods

Site description

- Field study initiated in 2015 at University of Manitoba Research farm, near Carman (49°29'53N 98°01'47W), Manitoba.
- The soil at this site was an imperfectly drained Gleyed Black Chernozem soil (Elm Creek series) with low nitrate N content of 44 kg/ha (0-60 cm), low Olsen-P of 23 ppm and low organic matter content of 1.8%. Previous crop was spring-wheat.
- Total precipitation received during 2015 growing season was 370 mm, which was 114% of the normal precipitation.

Experimental Design

RCBD with 4 replicates

Treatments

- 0, 17, 34, 50, 68, 85 kg N/ha
- Applied as urea broadcasted and incorporated before planting

Field Management

- Soybean (DKC 2510 RR) inoculated with *Bradyrhizobium* inoculant (Cell-Tech)
- target plant population of 444600 plants/ha on 15-inch row spacing

Sample collection

- The following samples were collected at the R1 and R5.5 stages:
 - Plant biomass from 1 m row length
 - 10 roots for nodule counts
- Soybean harvested for seed yield and seed quality analysis.

Statistical analysis

- ANOVA was performed using Proc Mixed procedures in SAS version 9.4 (SAS Inst., Cary NC) utilising a critical p value=0.05