

Soybean Response to Potassium Fertilization in Manitoba

The standard 100 ppm soil test K threshold is unreliable for predicting soybean yield response to K fertilization in Manitoba. Where soil test K values are less than 100 ppm, K fertility can be maintained by applying fertilizer at rates to match expected soybean removal.

SOYBEANS REMOVE POTASSIUM (K) at a much greater rate than most other crops grown in Manitoba. Large amounts of K removal (1.1–1.4 lbs K_2O /bu) coupled with expanded production has led to an increased occurrence of K deficiency symptoms in soybeans. This has raised questions about proper K fertility when soybeans are grown in rotation, especially in sandy Manitoba soils that may be inherently low in K.

The objectives of this research were to:

- investigate the frequency of soybean yield response to K fertilization across a range of soil test K (STK) concentrations
- determine the effectiveness of different K fertilizer rate and placement combinations to improve soybean yield.

Field scale trials in cooperation with MSPG's On-Farm Network were used to investigate the frequency of soybean yield response to 60 lbs K_2O /ac banded away from the seed or 120 lbs K_2O /ac broadcast and incorporated prior to planting. STK ranged from 49–451 ppm to investigate responsiveness on both sides of the standard 100 ppm ammonium acetate STK threshold listed in the *Manitoba Soil Fertility Guide* (Table 1).

Small plot trials were established to test K fertilizer rate and placement combinations, including 30 or 60 lbs K_2O /ac side-banded at planting, and 30, 60 or 120 lbs K_2O /ac broadcast and incorporated prior to planting. These trials were conducted on low K soils (49–117 ppm ammonium acetate STK) to increase the likelihood of response. In the second year of the study, an additional small plot trial was conducted on low K soils to investigate the K responsiveness of soybeans

compared to barley, which is known to respond to K fertilization in Manitoba.

In the field scale on-farm trials, soybean yield generally did not respond to K fertilization. Only two out of 19 site-years had significant yield increases, but there were no differences in mid-season tissue K concentrations and only one of these two responsive sites had background STK below 100 ppm.

There were no significant yield differences between K fertilizer treatments for any of the seven small plot site-years. This was surprising, given that the soils at these sites were low in K. In the barley-soybean K responsiveness comparison,

K fertilization did not influence soybean yield. However, barley yield significantly increased by about 20% across the three sites (Figure 1). This indicates that soybeans appeared to use K reserves in the soil that barley did not.

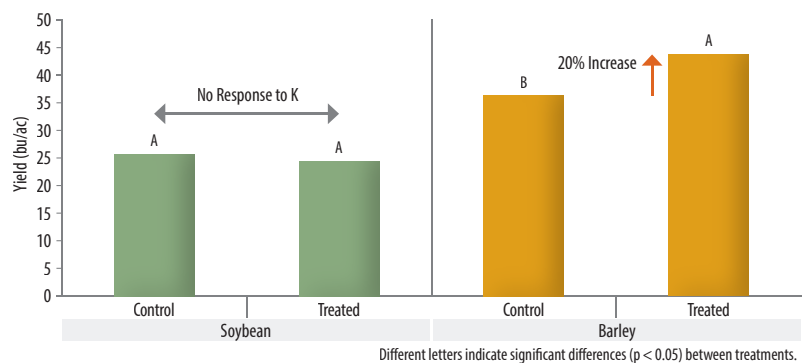
Overall, the frequency of soybean yield response to K fertilization was much lower than expected. The ammonium acetate STK threshold of 100 ppm proved to be an unreliable predictor of soybean response to K fertilization, but it did accurately predict barley yield response.

Soybean K response may be infrequent in Manitoba, but it is important to maintain K fertility throughout a rotation to support yields of other crops. Farmers can use expected soybean K removal rates and yields to estimate the amount of K fertilizer that is required to ensure adequate supply for all crops grown in rotation. Further research is needed to investigate the threshold for soybean K fertilization in Manitoba and to explore alternative soil tests that may be more accurate at predicting soybean K response than the current ammonium acetate method. ▾

Table 1. Manitoba Soil Fertility Guide potassium (K) recommendations for soybean production.

Ammonium Acetate Soil Test K Level	Recommendation
>100 ppm	No additional K
50–75 ppm	30 lbs K_2O /ac broadcast and incorporated
<25 ppm	60 lbs K_2O /ac broadcast and incorporated

Figure 1. Soybean and barley responsiveness to potassium (K), at three site-years, comparing soils low in K (control) and soils treated with 120 lbs K_2O /ac, broadcast and incorporated prior to planting.



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MPSG INVESTMENT \$60,314

CO-FUNDER Western Grains Research Foundation

DURATION 3 years