

Phosphorus (P) application in winter cereals is important to ensure proper growth and establishment and also provides an opportunity for building soil phosphorus levels. Current P fertilizer requirements for fall rye production were developed using conventionally bred varieties. However, hybrid fall rye varieties have been developed and are becoming more widely utilized, so it is relatively unknown what level of seed-placed P is safe for these new varieties.

This small plot trial was conducted at Melfort, SK to demonstrate the effects of various P fertilization options in fall rye. The treatments are listed in Table 1. On October 24, 2018, KWS Daniello was seeded at 294 seeds/m² into canola stubble at a 1-inch depth.

Table 2. Treatment means for phosphorus application in fall rye trial in Melfort, SK 2019. Means within a column followed by the same letter do not significantly differ.

P Rate	Placement	Plant Density (plants/m ²)	Yield (kg/ha)	Residual soil P ₂ O ₅ (ppm)
0 lb P/ac	None	98.4 a	2471.8 b	13
25 lb P/ac	Seed-placed (SP)	82.0 a	3122.0 ab	11
50 lb P/ac	Seed-placed	91.8 a	3357.7 ab	14
75 lb P/ac	Seed-placed	67.2 a	3556.6 ab	11
25 lb P/ac	Side-band (SB)	97.9 a	2625.9 b	14
50 lb P/ac	Side-band	101.7 a	2586.8 b	11
75 lb P/ac	Side-band	93.4 a	3908.3 a	12
100 lb P/ac	Side-band	86.2 a	2560.5 b	18
25 + 25 lb P/ac	SP+SB	71.3 a	3166.3 ab	23
50 + 25 lb P/ac	SP+SB	79.2 a	3100.6 ab	13
50 + 50 lb P/ac	SP+SB	88.6 a	3010.7 ab	12

Applications of up to 100 lbs of P/ac were used without any severe consequences to plant populations or yield, and did result in higher soil residual P levels. Yields were also relatively unaffected by phosphorus rate and placement, however yield increased slightly with additional phosphorus in the seed row up to 75 lbs/ac. Side-banding all phosphorus did appear to be slightly less effective with 3 out of 4 side-banded treatments demonstrating lower yields than the split and seed-placed treatments. Side-banding resulted in the greatest net returns with 100 lb P/ac showing promise as a break-even venture. Overall, this trial demonstrated that greater than required phosphorus rates can be tolerated by fall rye when side-banded or split applied. However, split application can be more beneficial in the year of application for growth and development, without harming the developing seeds. Lastly, considerably higher rates of phosphorus can be effective for increasing soil P residual levels; however, it may come with a yield penalty. Therefore, these higher rates should be used solely for long-term phosphorus replacement strategies and not for any benefits in the year of application.

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Table 1. Treatments used in phosphorus application in fall rye trial in Melfort, SK 2019.

#	Applied P (lb P ₂ O ₅ / ac)	Placement
1	0	None
2	25	Seed-placed (SP)
3	50	Seed-placed
4	75	Seed-placed
5	25	Side-band (SB)
6	50	Side-band
7	75	Side-band
8	100	Side-band
9	25 + 25	SP + SB
10	50 + 25	SP + SB
11	50 + 50	SP + SB

Seed-placed P is often used as the best means of P fertilization due to poor P mobility in the soil. However, side-band applications are desirable as they diminish the risk of salt damage to the seed and allow for higher rates of P to be applied. In this trial, application of SP P above 50 lb/ac resulted in a slight negative impact to plant population and a slight positive impact on yield (Table 2).