

Hybrid Rye Fertilization Rates

Interest and acreage of fall rye has grown substantially in Manitoba. Hybrid rye has about a 20% yield advantage over traditional open pollinated (OP) varieties and are expanding onto more productive soils than rye's historic range on the droughty sands.

With increased yield potential comes the question about nitrogen rates to sustain that higher yield. The hybrids are shorter and more lodging tolerant, so one might suspect they can tolerate more nitrogen, and hence respond to more nitrogen. Very few studies have looked at nitrogen rates of the open pollinated versus hybrid varieties. Three Saskatchewan studies provide the extent of the data (Figure 1). From this data we observe the substantial yield increase of the hybrids over the open pollinated variety but that similar rates of nitrogen are required to optimize yield of each.

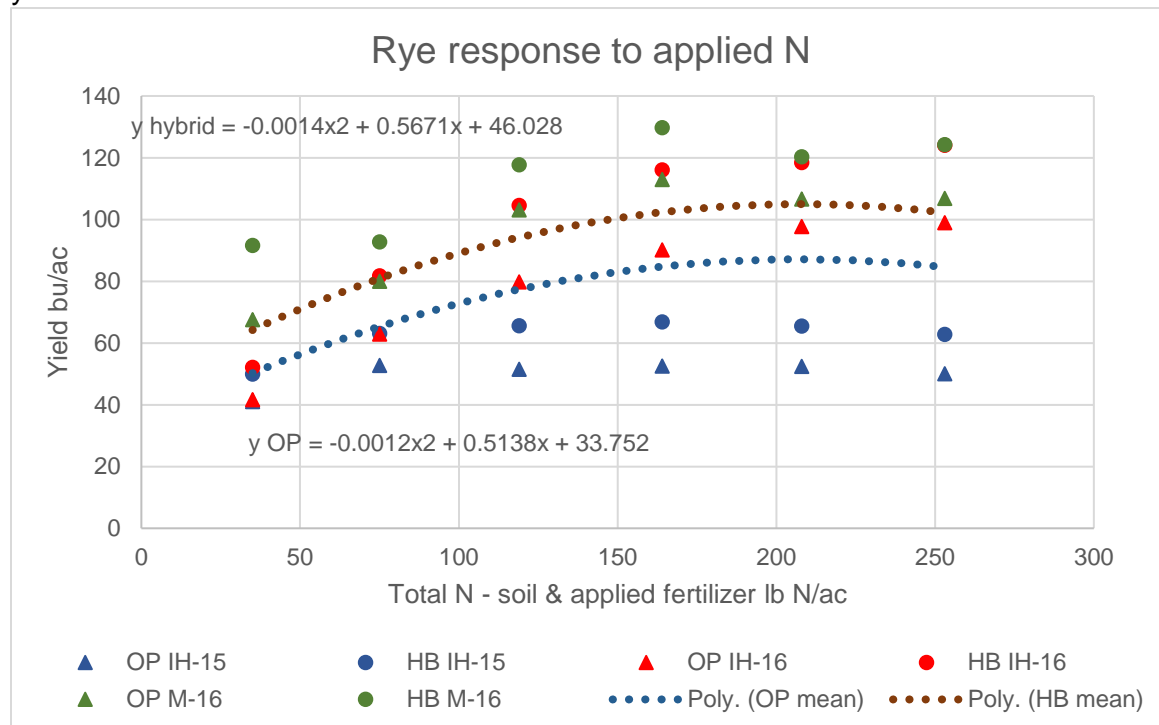


Figure 1. Hybrid (HB ●) and open pollinated (OP▲) fall rye response to soil and applied nitrogen (Holzapfel, 2016). Sites at Indian Head (IH) in 2015-16 and Melfort (M) in 2016, with soil test N of 24-30 lb N/ac. The mean quadratic response function is shown as dotted lines and written equation.

The maximum yield ranged from 67-130 bu/ac for hybrid rye and 53-113 bu/ac for OP rye.

Based on the quadratic response, Manitoba Agriculture 2019 Cost of Production values of fall rye at \$4.50/bu and nitrogen cost of 60 cent/lb N, the calculated economically optimum nitrogen rates are:

- Hybrid rye = 155 lb Total N (soil & fertilizer)/ac producing 100 bu/ac, an N requirement of 1.6 lb N supply /bu (ie. N requirement is 1.6 x yield potential – soil N).
- OP rye = 159 lb Total N (soil & fertilizer)/ac producing 85 bu/ac, an N requirement of 1.9 lb N supply /bu.

The nitrogen rate guideline in Table1 is developed with limited data, so is considered a starting place until more studies are completed.

Table 1. Nitrogen guidelines for open pollinated and hybrid fall rye based on spring broadcast applications.

		Open pollinated @ 1.9 lb N/bu			Hybrid @ 1.6 lb N/bu		
Target Yield bu/ac		40	60	80	60	80	100
<u>Soil nitrate-N</u> lb N/ac in 0-24" Rating		Nitrogen suggestion (lb N/ac)					
0	VL	75	115	150	105	130	160
10	VL	65	105	140	95	120	150
20	VL	55	95	130	85	110	140
30	L	45	85	120	75	100	130
40	M	35	75	110	65	90	120
50	M	25	65	100	55	80	110
60	H	15	55	90	45	70	100
70	H	5	45	80	35	60	90
80	VH	0	35	70	25	50	80
90	VH	0	25	60	15	40	70
100	VH+	0	15	50	5	30	60

How do these rates compare?

- Manitoba Soil Fertility Guide simply gives a general 40-65 lb N/ac rate for fall rye, without considering soil N supply
- Based on Manitoba Crop Insurance data, the recent 5 year average fall rye yield is 55 bu/ac with average applications of 70 lb N/ac. If typical soil N was presumed to be 30-40 lb N/ac, then total N supply would have been 100-110 lb N/ac.
- Other jurisdictions consider higher N rates; a 2.5 -2.7 lb total N/bu requirement (ie South Dakota, AgVise Labs) or 100, 150 and 200 lb total N supply/ac for potential yields of <40, 40-60 and > 60 bu/ac, respectively (North Dakota).

Growers should apply spring nitrogen early to fall rye as delayed applications reduce yield response. It has also been observed that traffic injury of growing seedlings may increase incidence of ergot in the crop.

References:

Manitoba Soil Fertility Guide

Holzappel, C. 2016. Nitrogen Response of Modern Fall Rye Varieties. Project #20150322. <https://iharf.ca/wp-content/uploads/2017/04/Nitrogen-Response-of-Modern-Fall-Rye-Varieties.pdf>