

Spring Barley Nitrogen Response X Fungicide Interactions

Purpose:

Recent research has shown synergy between fungicide and nitrogen in winter wheat. This trial was designed to investigate if any similar synergy exists in spring barley. The data generated from this trial will also be used to update the nitrogen recommendations for spring barley with and without fungicide (Agronomy Guide, Publication 811). From the nitrogen response curves we will be able to determine the Maximum Economic Rate of Nitrogen (MER-N), both with and without fungicide.

Methods:

Four field scale trials were established across southwestern Ontario in the spring of 2014 (target was 5 locations). Plot design was field scale, two replicate, randomized N rates at each site, with and without fungicides. Post-harvest soil nitrate tests were collected to evaluate soil residual N and potential environmental impact from higher N applications.

Other than the nitrogen rate and fungicide (with, without), all variables at each field location were consistent across all treatments, following the normal production practices based on the producer. At 3 of the sites spring nitrogen was applied by broadcasting urea with a Valmar airflow applicator, while UAN was used at a fourth site. The treatments are as followed

1. Check (No nitrogen applied) with fungicide
2. 30lbs Nitrogen (30N) with fungicide
3. 60lbs Nitrogen (60N) with fungicide
4. 90lbs Nitrogen (90N) with fungicide
5. 120lbs Nitrogen (120N) with fungicide
6. Check (No nitrogen applied) without fungicide
7. 30lbs Nitrogen (30N) without fungicide
8. 60lbs Nitrogen (60N) without fungicide
9. 90lbs Nitrogen (90N) without fungicide
10. 120lbs Nitrogen (120N) without fungicide

Data collected from these sites included disease ratings, yield, moisture, test weight, 1000 kernel weights, protein and lodging. Post-harvest soil nitrate samples were collected to observe environmental impact with increased nitrogen application.

Results:

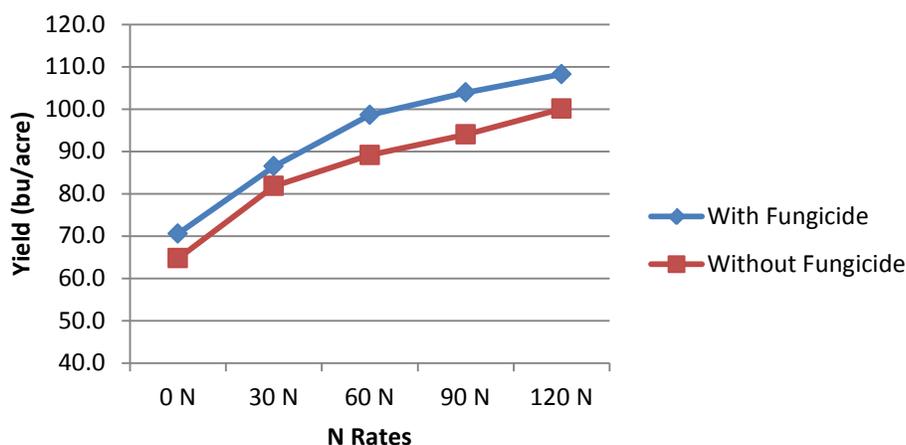
The average yield results are summarized in Table 1. Yields for both the fungicide and no fungicide treatments increased quickly as nitrogen was added. The treatments with fungicide did increase slightly faster but differences are small. The N response curve is shown in Figure 1.

Table 1: Breakdown of Yields With and Without Fungicide (bu/ac)

Treatment	With Fungicide	Incremental Gain	No Fungicide	Incremental Gain
0 N	70.5	-	64.7	-
30 N	86.4	15.9	81.8	17.1
60 N	98.6	12.2	89.1	7.3
90 N	103.9	5.3	94.0	4.8
120 N	108.2	4.3	100.1	6.1

Figure 1:

N Rates With and Without Fungicide



Economic Analysis: Using urea at \$586/tonne (\$0.58/lb of actual N) and spring barley at \$4.10/bushel (current values at time of writing), 4.3 bushels/acre of barley are required to cover the cost of 30lbs of N ($\$0.58/\text{lb} \times 30\text{lbs} = \$17.40 / \$4.10/\text{bu} = 4.3$ bushels). With the addition of fungicide application, costs increase by \$18.00/ac. In order to cover the cost of the fungicide, you would need an additional increase of 4.4 bushels/acre ($\$18.00 / \$4.10 = 4.4$ bu). Based on the above assumptions 60 N appears to have the highest economic return, with or without fungicide. There appears to be little difference between yield increases based on fungicide applications, a distinctly different outcome than winter wheat (but only one year data). Economics above 60N are breakeven for no fungicide, and negative for fungicide applied. A previous study (2010-2012, Johnson and McClure) found only a 3 bu/ac yield increase between 60 N and 120 N when a fungicide was applied. More data definitely needs to be generated before any conclusions are drawn.

The average protein results are summarized in table 2. Three sites had very little change in protein across all treatments (<0.6%), while one site had a 2% increase in protein from 0 N to 120 N.

Table 2: Protein (%)

Treatment	With Fungicide	No Fungicide
0 N	11.3	11.4
30 N	11.4	11.5
60 N	11.7	11.6
90 N	11.8	11.9
120 N	12.0	11.8

No difference in test weight or 1000 Kernel weight is evident. Post-harvest nitrate results will be available after the samples are analyzed.

Summary:

Preliminary results are inconclusive as to whether a synergy does exist between N and fungicide in spring barley. Response to fungicide was variable with 2 sites having minimal yield increase with fungicide while yields increased by 12 bushels/acre at the other 2 sites with the addition of a fungicide.

Based on limited data 60 N with fungicide was the most economic treatment. More data is needed before any conclusions on nitrogen rate are drawn. Growing conditions were excellent for spring cereals in 2014: it will be interesting to see if we get similar results next year.

Next Steps:

This is the first year for this project. Research will be gathered and continued for another 2 years (2014-2016). Anyone who is having interested in participating in this trial is encouraged to contact Peter Johnson at peter.johnson@bell.net, or Shane McClure at shane.mcclure@ontario.ca. Data collected from this trial will be used in multiple articles, as well as presentations.

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Location of Project Final Report:

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