

Winter Wheat Seeding Rate X Seeding Date Interactions

Purpose:

Seeding rate recommendations for winter wheat in Ontario have long been standardized across seeding dates, soil types, and varieties. Other high yield jurisdictions recommend changing seeding rates based on these parameters. This study investigated the validity of current seeding rate recommendations, as well as the impact of seeding date and soil type on the seeding rates evaluated.

The high yield potential of early planted wheat is well documented. How low can you go with your seeding rate when seeded early, and are there any potential benefits to using a higher seeding rate when planting early or planting late? The results from this trial will provide recommendations for seeding rates throughout the entire planting season from ultra-early to ultra-late.

Methods:

Two replicate field scale trials have been initiated at 35 locations from 2006 - present. A full treatment list is posted below:

1. 0.9 million seeds per acre
2. 1.2 million seeds per acre
3. 1.5 million seeds per acre
4. 1.8 million seeds per acre
5. 2.1 million seeds per acre

Two sites included some or all of the 5 treatments repeated at different planting dates. Almost all of the sites have been planted using a 1560 JD drill (1590 boots) with a Dickey-John seed monitor to make sure actual seeding rate is close to the target seeding rate (drill technology makes accurate seeding rate challenging!). Harvest measurements included yield, moisture, test weight, 1000 kernel weight, lodging and protein.

Results:

The yield results from the sites containing all 5 treatments are summarized in table 1. On average wheat yields began to stabilize at 1.5 million seeds/acre. Yields did increase slightly (no statistical difference) with higher seeding rates but gains were minimal.

Table 1: Yield Results from 2006 – 2013 (bu/ac @ 27 Sites)

| Seeding Rate (million seeds/acre) | 2006 | 2007 | 2008 | 2009 | 2013 | Trial Average |
|---|------|------|------|------|-------|------------------|
| 0.9 | 94.2 | 82.6 | 92.2 | 71.3 | 102.3 | 87.4 |
| 1.2 | 94.1 | 84.4 | 96.0 | 71.3 | 102.7 | 88.9 |
| 1.5 | 98.9 | 86.5 | 95.5 | 75.1 | 103.4 | 90.5 |
| 1.8 | 96.3 | 86.3 | 94.8 | 73.6 | 105.0 | 90.2 |
| 2.1 | 94.3 | 88.4 | 96.0 | 74.9 | 104.2 | 91.1 |

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When the data is analyzed based on planting date it becomes clear that there is an interaction between planting date and yield response to increased seeding rate. Sites planted between September 15 and September 30 reached an average maximum yield with 1.2 million seeds/acre while sites planted in early October reached a maximum yield with 1.8 million seeds/acre. There are currently not enough sites that were planted during late October or November to accurately compare yield response to seeding rate. However, the limited number of sites along with other research (SMART II) has shown a definite benefit to high seeding rates with late planted wheat.

Table 2: Yield Results by Planting Date

| Planting Date | # of Sites | 0.9 | 1.2 | 1.5 | 1.8 | 2.1 |
|---------------|------------|---------------------------------|-------|-------|-------|-------|
| | | Seeding Rate (million seeds/ac) | | | | |
| Sept 15 - 30 | 10 | 97.5 | 99.8 | 99.3 | 98 | 99.9 |
| Oct 1 - 15 | 5 | 98.9 | 100.8 | 100.7 | 102.9 | 102.4 |

Table 3 shows the yield results from selected locations by planting date. The Lucan site had side by side trials planted in the same field at 2 different planting dates (Sept 17 and Sept 30). This shows the great yield potential of early planted wheat. Planting wheat on Sept 17 vs Sept 30 resulted in a substantial yield increase while also using a lower seeding rate. Lodging in the Sept 17 planting occurred in the 1.8 and especially the 2.1 treatments, resulting in slightly decreased yields. No lodging occurred in the Sept 30th planting. At this location the Sept 17th date would be considered ultra-early, the Sept 30th date still on the early side of normal, with normal being Oct 4-10.

Nowhere is the potential negative impact of lodging more evident than at the Glen Allan location. As seeding rates increased so did lodging which resulted in yields being reduced by 12 bu/acre across the treatments.

Table 3: Site Specific Data

| Location | Planting Date | 0.9 | 1.2 | 1.5 | 1.8 | 2.1 |
|------------|---------------|---------------------------------|-------|-------|-------|-------|
| | | Seeding Rate (million seeds/ac) | | | | |
| Lucan | 17-Sep | 119.7 | 120.9 | 123.6 | 122.1 | 121.1 |
| Lucan | 30-Sep | 105.9 | 107.6 | 106.4 | 114.4 | 116.7 |
| Glen Allan | 17-Sep | 117.5 | 115.2 | 112.0 | 109.1 | 105.6 |

Summary:

The yield potential of early planted wheat is extremely exciting but it is important that seeding rates are kept low or lodging could become a serious problem. As wheat planting gets delayed later into the year seeding rates should be increased to account for the reduced time the plant has for tillering. Note that this study uses a Sept/Oct breakdown, which is appropriate for the area the trials were conducted in. The dates used to impact seeding rates should be adjusted if your farm is in the extreme southwest of far north of the province.

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If planting in October seeding rates should be increased by 100,000 seeds above normal seeding rate for every 5 days that pass: ie: wheat planted on October 20th should increase seeding rate by 400,000 seeds/ac above your normal seeding rate. Normal seeding rates are considered to be 1.5 million seeds/acre on clay loam or lighter soils, and 1.8 million seeds/acre on heavy clay soils. Similarly, if wheat is planted early, seeding rates must be adjusted down, by at least 25% if seeding 10 days ahead of normal. No matter when you are planting your wheat it is important that seeding rates are adjusted according to planting date and soil type.

Next Steps:

An additional 6 sites were planted in the fall of 2013. Planting dates ranged from mid-September to mid-October. The focus of this new research will be to evaluate if lower early seeding rates will allow for higher N applications without lodging, and the impact of growth regulators, to achieve even higher yields. This research will also be used to discover what disadvantages there are for ultra-early planted wheat, and opportunities with ultra-late wheat. Plans for ultra-late wheat seeding in this year's trials failed due to weather. This will be attempted again in fall 2014, funding dependent. Anyone interested in participating in these trials is encouraged to contact Peter Johnson at peter.johnson@ontario.ca or Shane McClure at shane.mcclure@ontario.ca.

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