Optimizing Seeding Rates and Dates for Grain and Oilseed Crops

Irrigated Crop Production Update -2012
Lethbridge
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Irrigation water management has improved dramatically.
- 75% of land in S AB is irrigated using pivots.
- Pivot systems are up to 85% efficient!

Result - Precise amounts of water can be applied when needed to optimize crop water use!
To achieve optimum crop yields we need to:

1. Manage water to meet crop water use & requirements

2. Manage agronomic requirements

3. Manage crop nutrient requirements
To address some of these issues a research project with Five Experiments was initiated in 2006
Understand agronomic requirements

- When should **crops** be seeded?
- What is the **optimum seeding rate**, seeding depth, seed treatment?
# Crops Included in Research Study

- **Wheat:**
  - Hard Red Spring - 5602 HR
  - Soft White Spring - Andrew
  - Prairie Spring - 5701 PR
  - Durum - Morse

- **Triticale:**
  - Grain & Silage - Ultima

- **Barley:**
  - Malt - AC Metcalfe
  - Feed & Silage - Vivar

- **Oilseeds:**
  - Canola - HT 5020 Liberty
  - Flax - Flanders
Exp. 3 - Effect of Seeding Rate and Date on Crop Yields:

- All crops seeded on 4 dates:
  - starting as early as possible in spring (April 15-20)
  - seeding at 10 to 14 day intervals as weather permitted

- Cereals seeded at:
  - 5 rates (eg. 100, 200, 300, 400 & 500 seed/ m²)

- Flax seeded at:
  - 5 rates (eg. 200, 300, 400, 500 & 600 seed/ m²)

- Canola seeded at:
  - 5 rates (eg. 75, 125, 175, 225 & 275 seed/ m²)

- Located at Bow Island and Lethbridge each year
Seeding date and rate trials at Lethbridge - 2008
Effect of seeding date on Barley at Lethbridge - 2006
Effect of seeding date on Wheat types at Lethbridge - 2006

Yield (tonnes/ha) vs. Seeding Date

- HRSW
- SWSW
- CPS
- Durum

Legend:
- 1st
- 2nd
- 3rd
- 4th
Yield
% of Maximum

b) Durum

-1.3% d^{-1}
Barley Response to Seeding Date

Malt barley

Feed barley

Barley silage

-1.2% d^{-1}

-1.3% d^{-1}

-1.0% d^{-1}
Canola

-1.7% d⁻¹

excluded from analysis

Flax

-0.6% d⁻¹

## Affect on Crop Yield with Delayed Seeding

Yield reduction in % per day after May 1:

<table>
<thead>
<tr>
<th>Crop Type</th>
<th>Yield Decline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malt Barley</td>
<td>1.2%</td>
</tr>
<tr>
<td>Feed Barley</td>
<td>1.3</td>
</tr>
<tr>
<td>Barley Silage</td>
<td>1.0</td>
</tr>
<tr>
<td>Triticale Grain</td>
<td>0.8</td>
</tr>
<tr>
<td>Triticale Silage</td>
<td>1.1</td>
</tr>
<tr>
<td>Hard Red Sp W</td>
<td>0.8</td>
</tr>
<tr>
<td>Soft White Sp W</td>
<td>0.9</td>
</tr>
<tr>
<td>CPS Wheat</td>
<td>1.0</td>
</tr>
<tr>
<td>Durum</td>
<td>1.3</td>
</tr>
<tr>
<td>Canola</td>
<td>1.7</td>
</tr>
<tr>
<td>Flax</td>
<td>0.6</td>
</tr>
</tbody>
</table>
Benefits of Earlier Seeding?

• Farmers are in the business of harvesting the energy of the sun - seed earlier and capture more sunlight energy!

• All these crops are cool season crops - get the crops through the vegetative stages before the summer heat!

• Improved water use efficiency!

• Crops can get a head start on weeds!

• The more advanced crops are when diseases or insect pests move in - the less the effect on crop yield!
Summary of Seeding Date

- Delayed seeding after May 1 resulted in the greatest decline for Canola and least for Flax.

- If seeding can start in mid April - seed highest value cereal crops first followed by lower value cereal crops.

- By May 1 - priority is seed canola first - then highest to lowest value cereal crops then flax.

- Also consider other crops grown on the farm.
  - In early to mid-April could seed most frost tolerant crops first such as peas
  - Also consider value of special crops such as potatoes or corn.
Effect of Seeding Rate on Crop Yield Potential

Seeding Rate Exp - 11 crops were each seeded at 5 different rates.

Objective - Determine the optimum seeding range for each crop.
Effect of seeding rate on Wheat types at Lethbridge - 2007
Effect of seeding rate on Barley and Triticale silage at Lethbridge - 2007

![Graph showing the effect of seeding rate on yield of Barley and Triticale silage.](image)

- **Yield (tonnes/ha)**: The y-axis represents the yield in tonnes per hectare, ranging from 10 to 16.
- **Seeding Rate (seeds/sq m)**: The x-axis represents the seeding rate in seeds per square meter, ranging from 100 to 500.

- **Barley silage**: Represented by red squares and a solid red line.
- **Triticale silage**: Represented by blue circles and a dashed blue line.

The graph illustrates a positive correlation between seeding rate and yield for both Barley and Triticale silage, with Barley silage yielding slightly higher than Triticale silage at higher seeding rates.
a) CWRS wheat  
max = 98 ± 1  
d = 370 ± 140  
n = 3.6 ± 0.8  
R² = 0.26

b) Durum  
max = 98 ± 1  
d = 600 (set)  
n = 3.8 ± 0.2  
R² = 0.51

c) SWS wheat  
max = 98 ± 1  
d = 600 (set)  
n = 3.5 ± 0.2  
R² = 0.54

d) CPS wheat  
max = 98 ± 2  
d = 480 ± 230  
n = 3.2 ± 0.7  
R² = 0.53

e) Feed barley  
max = 98 ± 1  
d = 600 (set)  
n = 4.2 ± 0.5  
R² = 0.13

f) Feed triticale  
max = 98 ± 1  
d = 420 ± 140  
n = 3.1 ± 0.6  
R² = 0.52

g) Malt barley  
max = 97 ± 1  
d = 270 ± 30  
n = 3.1 ± 0.3  
R² = 0.35

h) Barley silage  
max = 94 ± 1  
d = 600 (set)  
n = 3.5 ± 0.3  
R² = 0.31

i) Triticale silage  
max = 98 ± 1  
d = 600 (set)  
n = 3.0 ± 0.1  
R² = 0.76

j) Canola  
max = 98 ± 1  
d = 600 (set)  
n = 5.0 ± 0.3  
R² = 0.27

Yield  
% of Maximum  

Seeding rate (seeds/m²)
Yield % of Maximum

Seeding rate (seeds/m²)

SWS wheat
Canola and Flax Seeding Rates

**Canola**
- max = 98 ± 1
- d = 600 (set)
- n = 5.0 ± 0.3
- \( R^2 = 0.27 \)

**Flax**
- max = 96 ± 2
- d = 590 ± 220
- n = 2.8 ± 0.8
- \( R^2 = 0.42 \)
Summary of Seeding Rate Trials

Optimum seed rate range for each crop assuming 95% germination, 10% mortality and 9” row spacing:

<table>
<thead>
<tr>
<th>Crop</th>
<th>Optimum Rate (Seeds/m²)</th>
<th>Optimum Rate (lb/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malt Barley</td>
<td>180-250</td>
<td>130</td>
</tr>
<tr>
<td>Feed Barley</td>
<td>200-350</td>
<td>195</td>
</tr>
<tr>
<td>Barley Silage</td>
<td>300-450</td>
<td>250</td>
</tr>
<tr>
<td>Triticale Grain</td>
<td>250-350</td>
<td>175</td>
</tr>
<tr>
<td>Triticale Silage</td>
<td>400-500</td>
<td>250</td>
</tr>
<tr>
<td>Hard Red Sp Wh</td>
<td>200-300</td>
<td>125</td>
</tr>
<tr>
<td>Soft White Sp Wh</td>
<td>300-450</td>
<td>190</td>
</tr>
<tr>
<td>CPS Wheat Wh</td>
<td>250-400</td>
<td>185</td>
</tr>
<tr>
<td>Durum</td>
<td>275-425</td>
<td>205</td>
</tr>
<tr>
<td>Canola</td>
<td>75-175</td>
<td>6</td>
</tr>
<tr>
<td>Flax</td>
<td>500</td>
<td>45</td>
</tr>
</tbody>
</table>
Summary Comments:

Seeding Date:
• Consider seeding cereal crops as early as soil moisture and temperature conditions allow - how does this compare to your normal farm practice?
• Caution: Consider frost risk and use caution when deciding when to seed canola

Seeding Rates:
• Consider seeding 40 acres of each crop you grow at a higher rate and compare to your normal rate for several years - would higher rates improve your yield potential?
Optimum Seeding Date and Rates for Irrigated Grain and Oilseed Crops

Irrigation farmers strive for optimum crop production. The timeliness of seeding is one of the most important agronomic practices for achieving high yields of cereal and oilseed crops under irrigation. As well, increased seeding rates can be useful for ensuring higher yields under irrigated conditions.

Studying seeding date and rate

From 2006 to 2009, two sites in southern Alberta were at the centre of a study to determine the optimum seeding date and rates for achieving high yields and quality of 11 cereal and oilseed crops. These crops were either typical for irrigated production in southern Alberta or had the potential for increased adoption due to high productivity or value. See the crops and cultivars used in the four-year study in Table 1.

Table 1: Crop types and cultivars used in the study

<table>
<thead>
<tr>
<th>Crop type</th>
<th>Cultivar</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWRS wheat</td>
<td>CWRS (Canada Western Red Spring)</td>
</tr>
<tr>
<td>Durum</td>
<td>CWAD (Canada Western Amber Durum)</td>
</tr>
<tr>
<td>CWRS wheat</td>
<td>CWRS (Canada Western Red Spring)</td>
</tr>
<tr>
<td>C50 wheat</td>
<td>C50 (Canada Prairie Spring Wheat)</td>
</tr>
<tr>
<td>Feed barley</td>
<td>Feed grain</td>
</tr>
<tr>
<td>Seed barley</td>
<td>Feed grain</td>
</tr>
<tr>
<td>Mix barley</td>
<td>Malting (3-row)</td>
</tr>
<tr>
<td>Barley straw</td>
<td>Silage</td>
</tr>
<tr>
<td>Trifalcan straw</td>
<td>Silage</td>
</tr>
<tr>
<td>Canola</td>
<td>Oilseed (hybrid cultivar)</td>
</tr>
<tr>
<td>Flax</td>
<td>Oilseed</td>
</tr>
</tbody>
</table>
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