An evaluation of soil water use efficiency for different seeding row spacing and stubble height

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Different results were reported in terms of row spacing effects on crop yield.

Narrow spacing increases equipment cost and draft (more openers per length of toolbar).

Narrow spacing may increase water use, decreasing water use efficiency (WUE).

Higher stubble was reported to increase yield and WUE.

Water is often the limiting factor for soil productivity in Saskatchewan.
Objective

To examine whether row spacing and stubble height have any significant impact on spring wheat and canola yield and WUE in the Brown soil zone in southwestern Saskatchewan.
Methodology

- Experimental years: 2012 (wet), 2013 (normal)
- Randomized complete block design
- Spring wheat and canola
- Direct seeding

Study site

![Map showing Swift Current and Central Butte]
### Experimental design Central Butte

#### Diagram:

- **Row spacing**: 30, 60 cm
- **Stubble height**: 15, 30 cm

#### Table:

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<td>30 cm</td>
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Experimental design Swift Current

Canola
- RS: 30 cm, 60 cm
- SH: 15 cm, 30 cm, 60 cm
- Treatments: RS(30,60cm), SH(15,30,60cm)
- 2012

Wheat
- RS: 15 cm, 30 cm, 60 cm
- SH: 15 cm, 30 cm
- Treatments: RS(15,30,60cm), SH(15,30cm)
- 2012
Precipitation and temperature

Central Butte

- Precipitation (mm)
- Mean Temperature (°C)

Swift Current

- Precipitation (mm)
- Mean Temperature (°C)

2012/1/1 to 2013/11/1

Central Butte:
- Precipitation: 225 mm
- Mean Temperature: 211 mm

Swift Current:
- Precipitation: 211 mm
- Mean Temperature: 205 mm
Soil water storage (SWS)
SWS in root zone (0-1.2 m) in mm were measured by gravimetric method just prior to seeding and just after harvest.

Water use (WU)
WU=(SWS at seeding – SWS at harvest stage in root zone ) + total precipitation during the crop growth period.

Yield (Y)
Grain yield in kg/ha was measured by hand, taking grain yield of a harvested row (1 m) for each plot.

Water use efficiency (WUE)
WUE=Y/WU
Analysis of variance

whether the row spacing, stubble height, and their interaction had any significant (P<0.05) effects on WU, yield, and WUE.
Results

Water Use Central Butte

Row spacing (cm) - Stubble height (cm)

Canola 2012

Water use (mm)

Wheat 2012

Canola 2013

Wheat 2013

Canola 2012

Wheat 2012

Canola 2013

Wheat 2013
Water Use Swift Current

Row spacing (cm) - Stubble height (cm)

Canola 2012

Wheat 2012

Canola 2013

Wheat 2013

Row spacing: 15 cm > 30 cm = 60 cm
Yield Central Butte

Canola 2012

Row spacing: 30cm > 60cm

Canola 2013

Row spacing: 30cm > 60cm

Wheat 2012

Row spacing: 30cm > 60cm

Wheat 2013

Row spacing: 30cm > 60cm

Row spacing (cm) - Stubble height (cm)
Yield Swift Current

Canola 2012

Row spacing: 15cm > 30cm > 60cm

Canola 2013

Row spacing: 15cm > 30cm > 60cm

Wheat 2012

Stubble height: 15cm = 30cm > 60cm

Wheat 2013

Row spacing: 15cm > 30cm > 60cm

Stubble height: 15cm = 30cm > 60cm

Row spacing (cm) - Stubble height (cm)
WUE (kg/ha mm)

Canola 2012

Wheat 2012

Canola 2013

Wheat 2013

Row spacing (cm) - Stubble height (cm)

Stubble height: 15 cm = 30 cm > 60 cm
Summary

Central Butte

- A 30 cm row spacing generally produced higher wheat and canola yield and WUE than a 60 cm spacing.

- Stubble height did not significantly influence yield and WUE for both crops.

Swift Current

- Row spacing significantly influenced wheat yield, and stubble height significantly influenced canola yield and WUE in 2012.

- Both row spacing and stubble height did not significantly influence yield and WUE for both crops in 2013.
A row spacing of 30 cm and stubble height of 30 cm appears to be optimum as it most consistently produced the highest yields and water use efficiency.
Thanks to
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Thanks for your attention!