Row Spacing and Seeding Rate Influence on Spring Canola Performance in the Northern Great Plains

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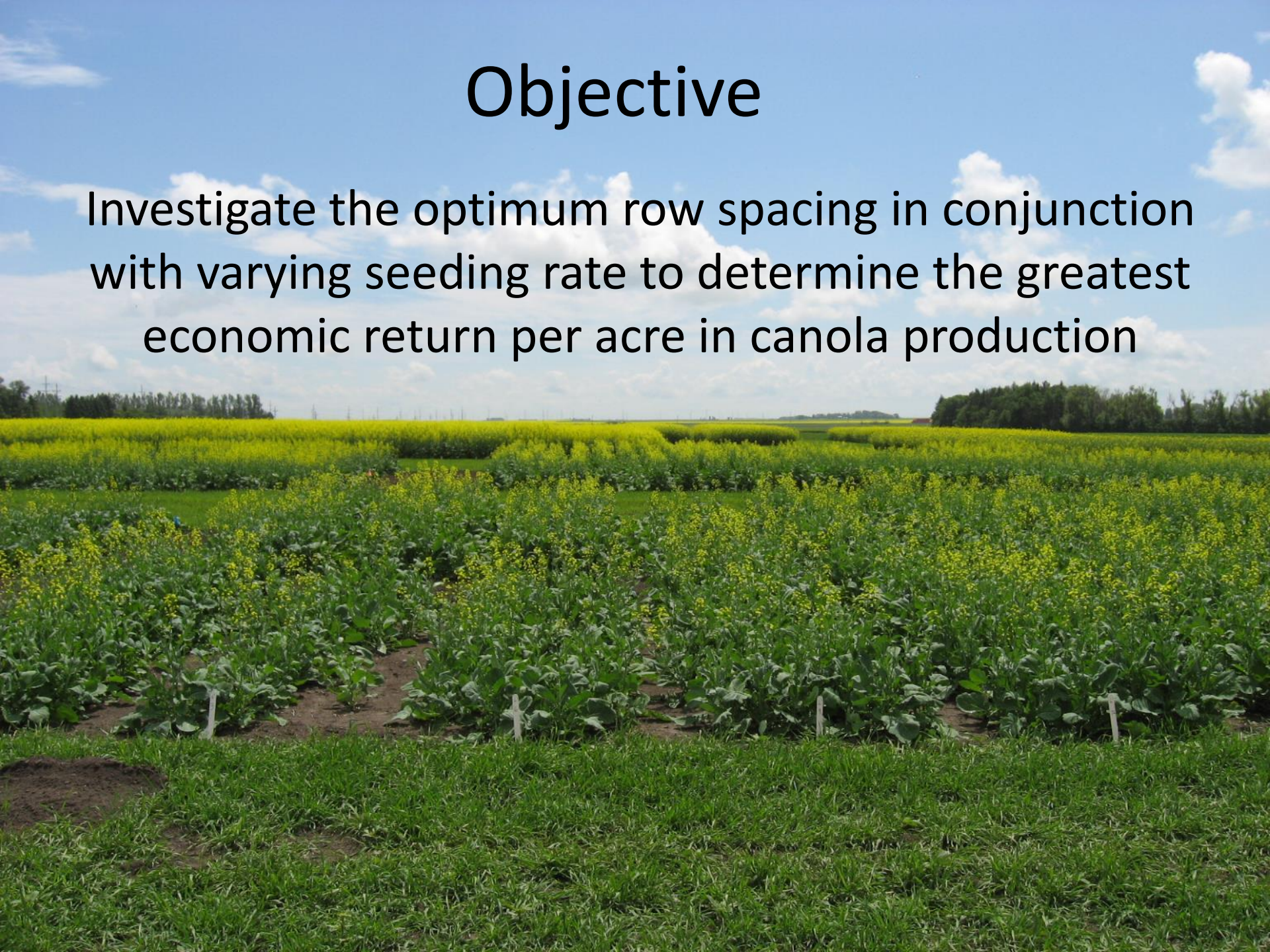
Introduction

- Spring canola (*Brassica napus L.*) is an important economic crop in North Dakota averaging 1.04 million acres annually the last 10 years.
- The canola industry is looking for ways to expand acreage in areas where row crops such as soybean, corn, dry bean and sugarbeets are grown.
- In these areas, there is potential to use row crop equipment to seed canola in wider row spacings than the current recommended 6 to 7 inches.
- Rising seed costs are a concern in canola production and the use of lower seeding rates in wider row spacing could enhance crop revenue.

Objective

Investigate the optimum row spacing in conjunction with varying seeding rate to determine the greatest economic return per acre in canola production



Narrow Row Spacing

- More uniform plant distribution (equal distance between plants) resulting in:
  - More efficient moisture, nutrient and light utilization.
- Less plant to plant competition.
- Quicker canopy closure / competition with weeds.

Wide Row Spacing

- Provides better residue clearance.
- Less soil disturbance / less power required
- More plant to plant competition within the row = thinner stems = more lodging.
- Delayed row closure – more weeds.

Previous Research

- Canada – Kondra (1975)
  - Row Width 6, 9, 12, 24 inches@ 2.5, 5.3, 10.7 lbs/a
    - Narrow row space at 5.3 lbs/a was optimum
- Canada – Christiansen and Drabble (1984)
  - No yield difference between 6 and 12 lbs/a
  - 9 inch row yield 11% less than 6 inch row
- Canada – Manitoba – Morris (1990)
  - Row Width 6 and 12 @ 1.3, 2.6, 5.3,10.7 lbs/a

    -1.3 to 2.6 lbs/a – highest yield in 6 inch row
    - Lodging reduced in narrow rows

Previous Research

- Canada – Thomas (2003)
  - 15 site years – 6 and 12 inch rows yielded similar
- Canada – Sask. – Kutcher et al. (2013)
  - Row width 9, 12, 18, 24 @ 8, 16, 24 seed/ft^2 in No-Till
  - Yield decreased 11% from 9 to 24 inches,
  - No difference between seeding rate
- North Dakota – Johnson and Hanson (2003)
  - No difference in yield or oil content between 6 and 12 in rows
- North Dakota – Ericksmoen – Minot REC (2014)
  - Row width 7, 15, 30 inch. 30 inch significantly less than 7 & 15
  - Seeding rate 7 – 17 seeds/ft^2, No yield difference.
- North Dakota – Hanson (2013-2014)
  - RR and LL optimum seeding rate at 9-12 seeds/ft^2 for yield and net return/acre

Materials and Methods

- Row spacing - 6, 12, and 24 inches
- Seeding rates – 3, 6, 9, 12 PLS/ft^2
- Design: Split plot – Row spacing – Main Plot, Seeding Rate – Subplot, 4 replications
- Variety: InVigor L140P, KWT-4.55 g, Germination-97%. Seed cost- $12.30/lb.
- October Market Price- 2015-$14.13/cwt, 2016-$14.70/cwt.
- Net Return $/a=grain value/a – seed cost/a
- Small plot planter, conventional tillage

Site locations

Langdon 2015

- Planted May 12
- Replanted June 4 due to soil crusting and frost
- June 5 – 2.36 inches of rain in 2 hours
- Harvest Sept 24
- May - August
  - Rainfall – 12.11 inches
  - Temperature – Mean 62

Langdon 2016

- Planted May 16
- Very good stands
- Harvest August 30
- May – August
  - Rainfall – 19.34
  - Temperature – 63

Prosper 2015

- Planted May 22
- Excellent stands
- Harvest Aug 22
- May – August
  - Rainfall - 15.09
  - Temperature – Mean 65

Prosper 2016

- Planted May 17
- Mixed stands – fair-good
- Harvest August 25
- May-August
  - Rainfall – 9.21
  - Temperature – Mean 66

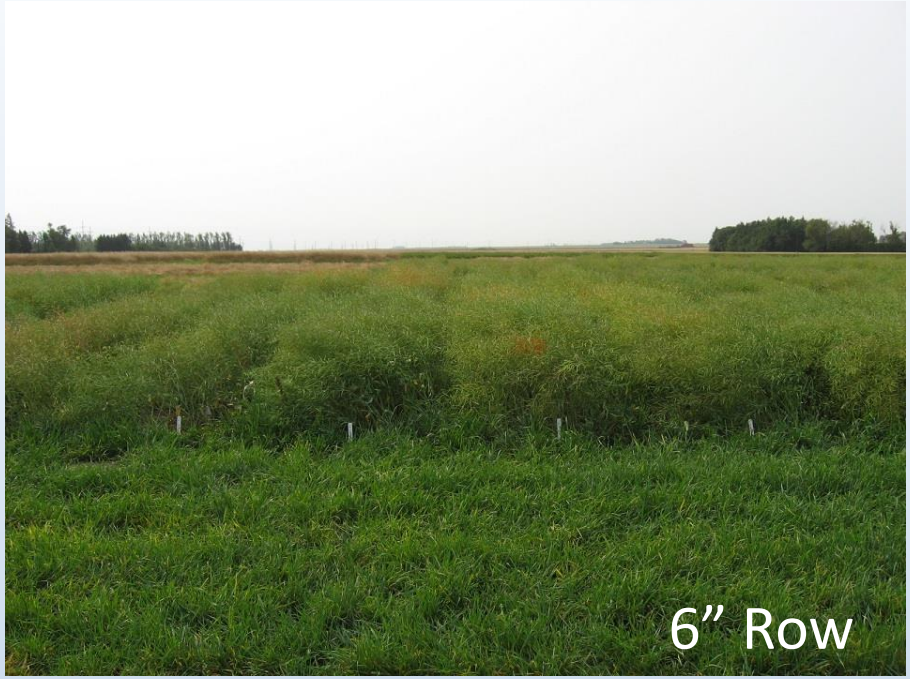
6 inch

12 inch

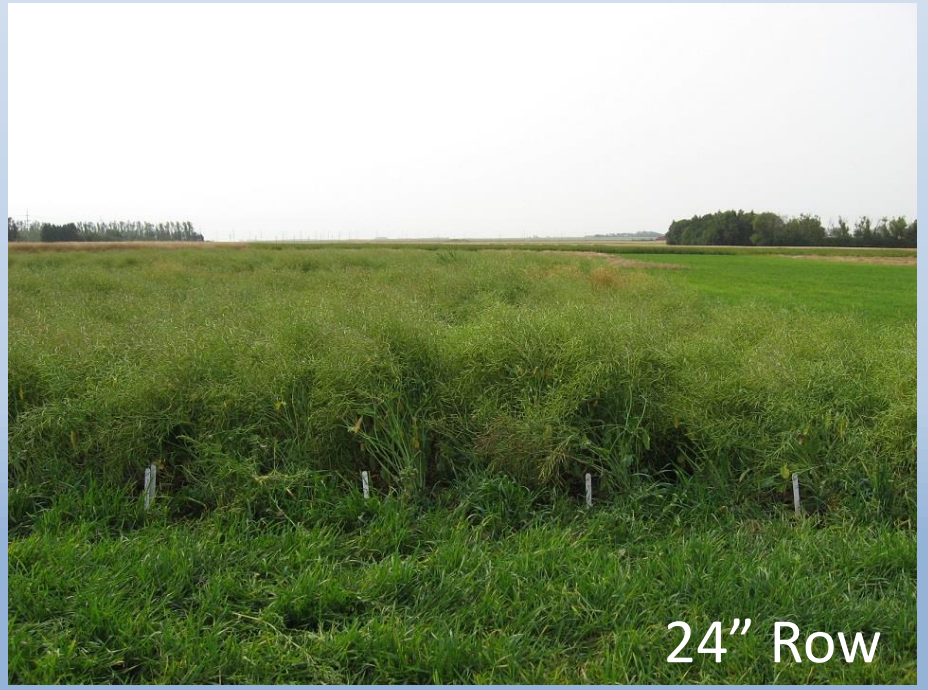
24 inch

Three row spacings, 6, 12, and 24 inch, at the 12 seeds/ft^2 seeding rate at flowering and post harvest stubble at Langdon, ND.

NDSU Langdon REC



- 6, 12, 24 in row
- 3, 6, 9, 12 PLS/ft^2 seeding rate
- September 11, 2015



NDSU Langdon REC

NDSU Langdon REC

Seeding rates, seed cost and target seeds per linear foot of row for trials at Langdon and Prosper, ND in 2015 and 2016.

Seeding Rate Seeds/ft^2	Seeding Rate lbs/acre	Seed Cost/acre	Seeds/acre	Targeted seeds per linear foot of row		
				6” row	12” row	24” row
3	1.35	16.61	131K	1.5	3.0	6.0
6	2.68	32.96	261K	3.0	6.0	12.0
9	4.05	49.82	392K	4.5	9.0	18.0
12	5.35	65.81	522K	6.0	12.0	24.0

Traits observed

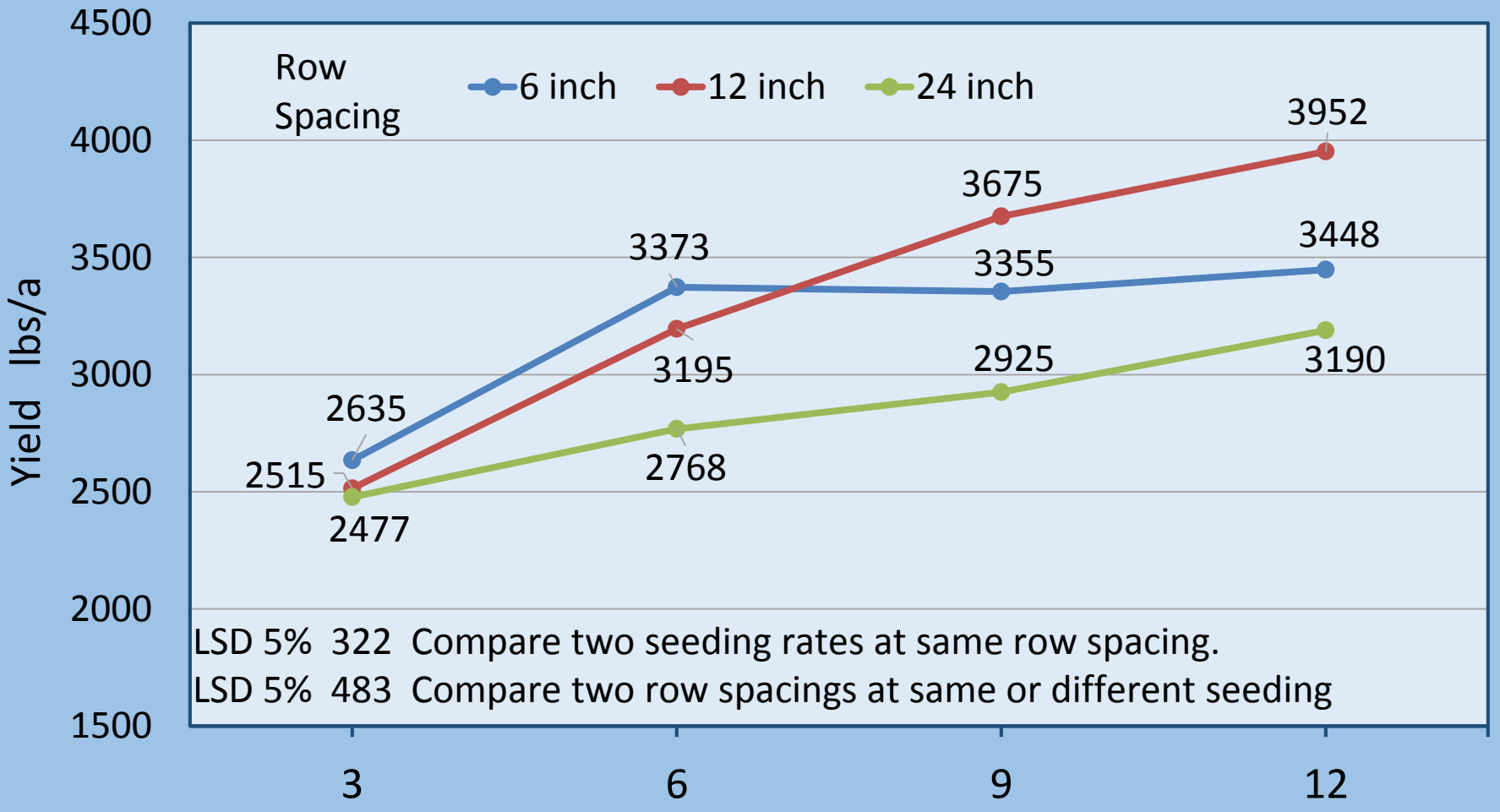
- Spring stand count
- Harvest stand count
- % Cover
- Days to 100% Cover
- Days to first flower
- Days to end flower
- Flower duration

- Days to mature
- Plant height
- Lodging
- 1000 kwt
- Oil Content
- Yield
- Net return/a

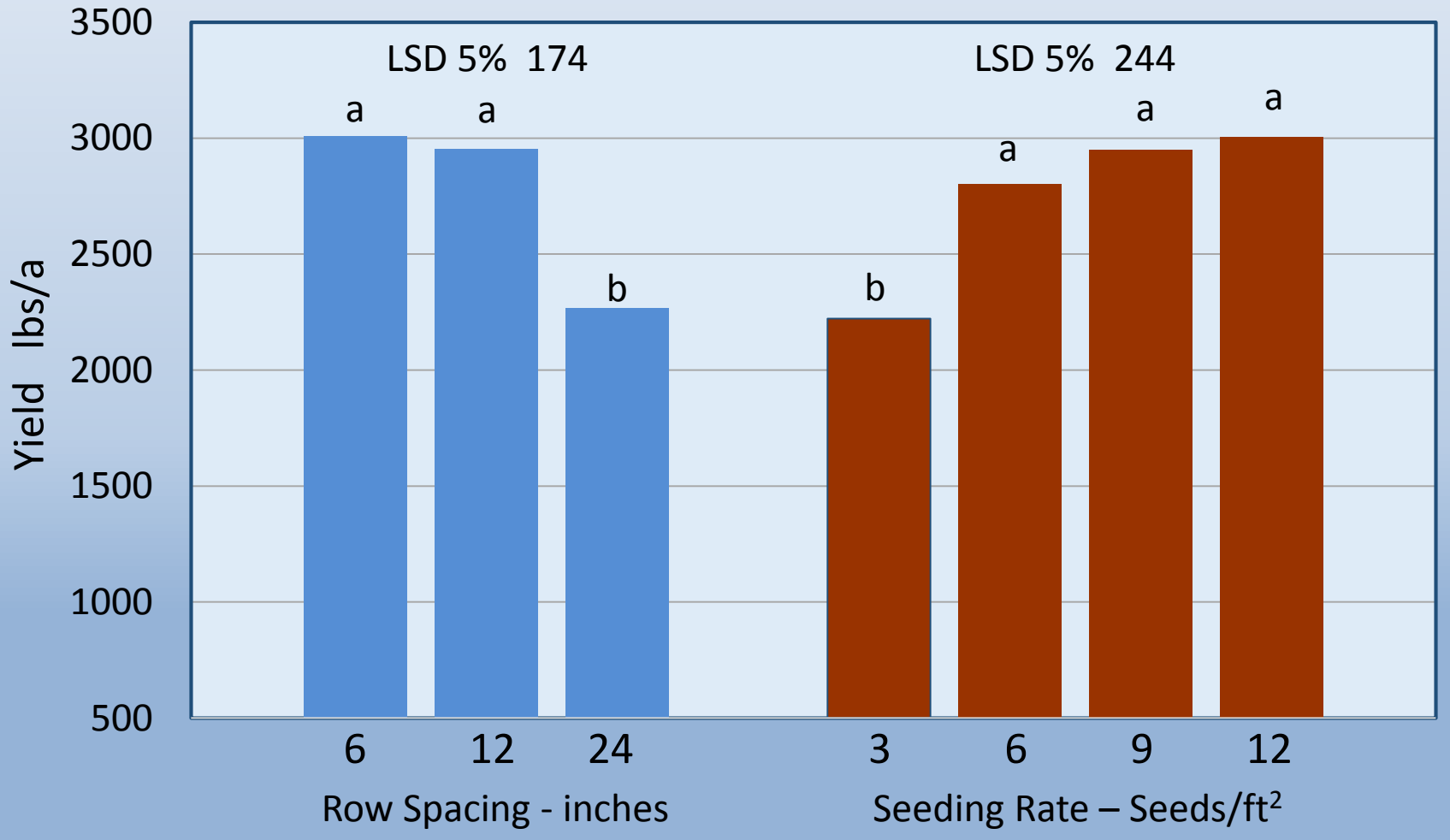
Percent pure live seed emergence of canola averaged across row spacings and seeding rates at Langdon, ND in 2015 and 2016.

Seeding Rate Seeds/ft²	Langdon 2015	Langdon 2016	Row Spacing Inches	Langdon 2015	Langdon 2016
3	41	94	6	40a	100a
6	57	84	12	35a	83b
9	47	92	24	71b	84b
12	49	88			
LSD 5%	NS	NS		11	14

Canola yield at four seeding rates and three row spacings at Langdon, 2015.



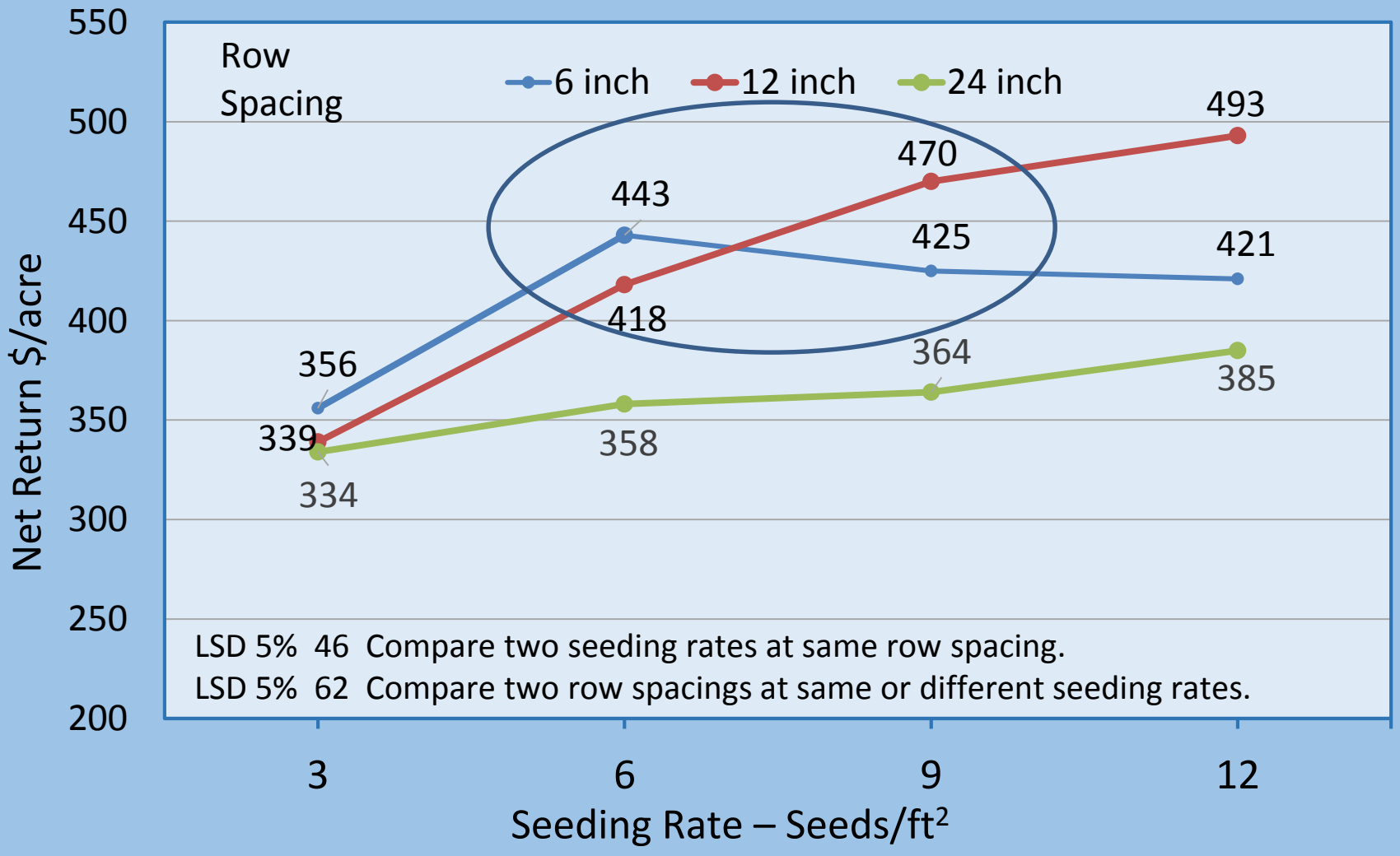
Canola yield at three row spacings averaged across four seeding rates and four seeding rates averaged across three row spacings at Langdon, 2016.



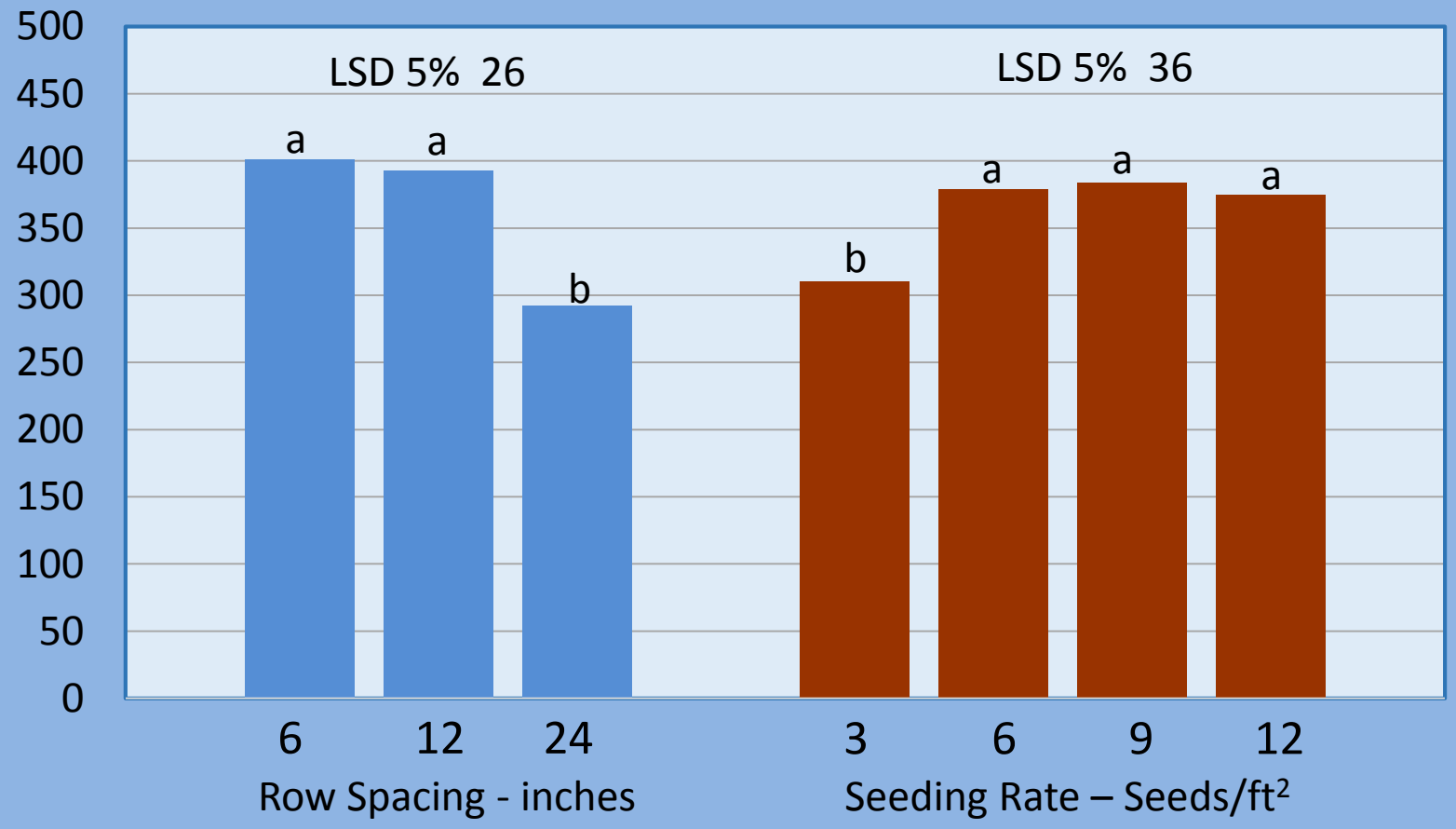
Canola yield at four seeding rates averaged across three row spacings and row spacings averaged across four seeding rates at Prosper 2015 and 2016.

Seeding Rate Seeds/ft^2	Prosper 2015	Prosper 2016	Row Width Inches	Prosper 2015	Prosper 2016
3	1720a	1513a	6	2194a	2333a
6	1985b	1999b	12	1891b	1776b
9	2165c	2131b	24	1972b	1737b
12	2206c	2152b			
LSD 5%	147	257		108	322

Canola Net Return $/acre at four seeding rates and three row spacings at Langdon, 2015.



Canola Net Return $/acre at three row spacings averaged across four seeding rates and four seeding rates averaged across three row spacings at Langdon, 2016.



Canola Net Return $/acre at four seeding rates averaged across three row spacings and three row spacings averaged across four seeding rates at Prosper 2015 and 2016.

Seeding Rate Seeds/ft^2	Prosper 2015	Prosper 2016	Row Spacing Inches	Prosper 2015	Prosper 2016
3	226a	206a	6	269a	301a
6	247b	260b	12	226b	219b
9	256b	263b	24	238b	214b
12	245ab	250b			
LSD 5%	21	38		15	47

Conclusions

- Canola in crusted soils in 24 inch row spacing may have improved emergence due to neighboring plants aiding each other in breaking the crust while in non-crusted soils emergence could be reduced from self thinning due to increased plant competition.
- At Langdon, the optimum combination of row spacing and seeding rate for Net Return $/acre was seeding in a 6 or 12 inch row spacing at a seeding rate of 6 or 9 seeds/ft^2.
- At Prosper, the optimum combination row spacing and seeding rate for Net Return $/acre was seeding in a 6 inch row spacing at a seeding rate of 6 or 9 seeds/ft^2.
- Effects of row spacing and seeding rate on agronomic traits (data not shown) of flowering, maturity, plant height, kernel weight, percent oil and lodging were very small or non-significant and would have little practical value in canola production.

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