Cool-Season Pulse & Canola Variety Trials

Simon Fordyce
Research Associate, Central Agricultural Research Center, Moccasin, MT

Photo Credit: Tanner Tompkins
Weather Summary, precipitation (inches)
2017 and 2018 crop years with 109-yr average, Central Ag Research Center, Moccasin, MT
Weather Summary, air temperature (°F)
2017 and 2018 crop years with 107-yr average, Central Ag Research Center, Moccasin, MT
Weather Summary, growing degree days
2017 and 2018 crop years with 107 yr average, Central Ag Research Center, Mccasin, MT
Spring Field Pea Variety Trial

(Pg. 31)

Photo Credit: Heather Fryer
Background

• Spring field pea may be grown economically as a green fallow crop or a grain crop in Montana

• Fallow replacement with pea can reduce nitrate leaching without decreasing profit (John et al., 2017)
Justification

• Montana’s dry pea yields are consistently depressed relative to those of other top-producing states (NASS, 2018).

• At CARC, selection of the appropriate variety can mean a difference in yield of 611 lb/ac (10 bu/ac) in a dry growing season (2017) and 889 lb/ac (15 bu/ac) in a wet growing season (2018; n=14)
Methods

• 23 varieties (6 green and 17 yellow cotyledon types)
• 8 experimental lines (results not shown)
• Planted: April 25\textsuperscript{th} in 2018, April 19\textsuperscript{th} in 2017
• Seeding rate: of 8 pure live seeds/ft\textsuperscript{2}
• Soil temperature at planting: 42 °F
• Seed treat: Apron Maxx (fungicide) and Cruiser Maxx (insecticide)
• Grizzly Too insecticide at 1.9 oz/ac applied on May 17\textsuperscript{th} for pea leaf weevil control
• Harvested: August 7\textsuperscript{th} in 2018, July 25\textsuperscript{th} in 2017
Spring pea variety trial results, yield (lb/ac)

Cultivars yielding statistically equivalent to 2018 top performer, Nette 2010 (Central Ag Research Center, Moccasin, MT, 2018)
Spring pea variety trial results, % lodging

Cultivars yielding statistically equivalent to 2018 top yielder, Nette 2010 (Central Ag Research Center, Moccasin, MT, 2018)

Statistical analysis includes cultivars not listed
Nette 2010

• Supplier: Pulse USA Inc.
• Seed color: Yellow
• Most similar to: Lumina
• Resistant to:
  • Fusarium Wilt – Race 1
• Susceptible to:
  • Powdery Mildew
• Among the earliest flowerers

Link to cultivar description sheet:
Hampton

• Owner: USDA ARS, Pullman, WA
• Seed color: Green
• Most similar to: Aragorn, Banner
• Resistant to:
  • Pea Enation Mosaic Virus
  • Bean Leaf Roll Virus
  • Powdery Mildew
  • Fusarium Wilt – Race 1
• Susceptible to:
  • Fusarium Wilt– Race 2

Link to cultivar description sheet:
Jetset

• Supplier: Meridian Seeds
• Seed color: Yellow
• Resistant to:
  • Fusarium Wilt – Race 1
• Susceptible to:
  • Powdery Mildew
• Among the top performers for:
  • Establishment
  • Vine Length and Plant Height
  • Lodging

Link to cultivar description sheet:
Delta

- Supplier: Limagrain
- Seed color: Yellow
- Among the top performers for:
  - Establishment
  - Lodging
Navarro

- Owner: DL Seeds Inc
- Supplier: Great Northern Ag
- Seed color: Yellow
- Most similar to: CDC Golden, DS Admiral
- No disease resistances tested
- Among the earliest flowerers
- Among the top performers for:
  - Vine length and Plant Height
  - Lodging
  - Kernel Weight

AAC Carver

• Supplier: Meridian Seeds
• Seed color: Yellow
• Resistant to:
  • Powdery Mildew
• Moderately susceptible to:
  • Fusarium Wilt – Race 2
  • Mycosphaerella blight
• Among the top performers for:
  • Establishment
  • Vine Length & Plant Height
  • Lodging

Link to cultivar description sheet:
Spring Lentil Variety Trial
(Pg. 34)
Background

• Spring lentil may be grown economically as a green fallow crop or a grain crop in Montana

• Spring lentil improves soil fertility and breaks pest cycles when incorporated into wheat-fallow or wheat-only systems
Justification

• Montana typically leads the nation in total lentil acreage, but the state’s production on a per acre basis is consistently below national averages.

• At CARC, selection of the appropriate variety can mean a difference in yield of $264 \text{ lb/ac}$ (4.4 bu/ac) in a dry growing season (2017) and $561 \text{ lb/ac}$ (9.3 bu/ac) in a wet growing season (2018; n=5).
Methods

• 5 varieties
• 61 experimental lines (results not shown)
• Planted on April 25th at a rate of 12 pure live seeds/ft²
• Soil temperature was 42 °F at time of planting
• Seed treat: Apron Maxx (fungicide) and Cruiser Maxx (insecticide)
• Harvested August 13th
Spring lentil variety trial results, yield (lb/ac)
(Central Ag Research Center, Moccasin, MT, 2018)

Statistical analysis includes cultivars not listed
Spring lentil variety trial results, % lodging

No statistical differences (Central Ag Research Center, Moccasin, MT, 2018)

Statistical analysis includes cultivars not listed
Avondale

• Owner: USDA ARS, Pullman WA
• Seed color/size: Medium Green
• Most similar to: Brewer, Merrit
• Tolerant to:
  • Stemphylium Blight
  • Stemphylium botryosum
• Earliest flowerer
• Among the tallest at vegetative stage

Link to cultivar description sheet:
CDC Maxim

- Owner: Crop Development Center
- Supplier: Pulse USA Inc.
- Seed color/size: Small Red
- Most similar to: CDC Redberry, CDC Impact
- Tolerant to: Anthracnose
- Resistant to: Ascochyta lentis
- Herbicide Resistance: Clearfield
- Among the tallest at maturity

Link to cultivar description sheet:
Spring Chickpea Variety Trial
(Pg. 37)
Background

• Chickpeas can be a challenging crop for growers due to problems with fungal diseases, particularly during periods of cool, wet weather.

• Chickpea prices decrease with seed size, falling off below 7 mm

• Seed size:
  • Desi < Large Kabuli < Large Café Kabuli
Justification

• Montana produces more chickpeas than any other state

• At CARC, selection of the appropriate named variety can mean a difference in yield of 754 lb/ac in a wet growing season (2018; n=9)
Methods

• 9 named varieties
• 30 experimental lines (results not shown)
• Planted on May 9th at a rate of 4 pure live seeds/ft²
• Seed treat: Apron Maxx (fungicide) and Cruiser Maxx (insecticide)
• Harvested September 7th
Chickpea variety trial results, yield (lb/ac)

Cultivars yielding statistically equivalent to 2018 top performer, CDC Orion (Central Ag Research Center, Moccasin, MT, 2018)

Statistical analysis includes cultivars not listed
Chickpea variety trial results, **1000 Kernel Wt (g)**

Cultivars yielding statistically equivalent to 2018 top performer, CDC Orion (Central Ag Research Center, Moccasin, MT, 2018)

Statistical analysis includes cultivars not listed
CDC Orion

- Owner: Crop Development Center
- Supplier: Meridian Seeds
- Seed type: Kabuli
- Most similar to: CDC Frontier
- Selected for improved Ascochyta Blight resistance
- Earliest flowerer

CDC Palmer

• Owner: Crop Development Center
• Supplier: Meridian Seeds
• Seed type: Kabuli
• From description, higher seed weight than:
  • CDC Leader (NS at CARC)
  • CDC Frontier (NS at CARC)
  • Amit
  • CDC Alma

Link to cultivar description sheet:
http://www.inspection.gc.ca/english/plaveg/pbrpov/cropreport/chkp/app00009571e.shtml
CDC Frontier

- Owner: Crop Development Center
- Supplier: Meridian Seeds
- Seed type: Kabuli
- Higher seed weight than Amit
- Among the top performers for:
  - Plant Height
  - Test Weight

Link to cultivar description sheet:
Nash

- Owner: USDA ARS, Pullman, WA
- Seed type: Café Kabuli
- Moderate resistance to Ascochyta Blight
- Among the top performers for:
  - Plant Height
  - Kernel Weight

Link to cultivar description sheet:
CDC Leader

• Owner: Crop Development Center
• Supplier: Meridian Seeds
• Seed type: Kabuli
• Earlier Maturity than CDC Frontier and Amit
• Moderate resistance to Ascochyta Blight

Link to cultivar description sheet:
Spring Canola Variety Trial
(Pg. 40)
Background

• Technological advances in hybridization systems have led to the release of canola hybrids, which generally outperform cultivars developed by traditional breeding methods

• Many herbicide resistances exist among canola hybrids (e.g., Liberty Link, Clearfield, Roundup Ready, Sulfonylurea)
Justification

- Canola acreage in Montana has increased at a rate of 14,000 acres per year since 2010 ($P < 0.01$)
- Statewide average yields have increased at a rate of 22 pounds per acre per year since 1999 ($P < 0.1$)
Justification

Source: National Agriculture Statistics Service (NASS)
Link to searchable database: https://quickstats.nass.usda.gov/
Justification

• At CARC, selection of the appropriate hybrid can mean a difference in yield of 278 lb/ac (5.6 bu/ac) in a dry growing season (2017) and 183 lb/ac (3.7 bu/ac) in a wet growing season (2018; n=6)

• Frost damage may explain greater differences in 2017
Methods

• 13 hybrids
• 6 suppliers
• 4 Herbicide Resistances
• Planted on April 26th at a rate of 14 pure live seeds/ft²
• Seed treat: Helix Xtra or Prosper for control of flea beetle
• Harvested August 10th
Spring canola variety trial results, yield (lb/ac)

Cultivars yielding statistically equivalent to 2018 top performer, 4187 RR (Central Ag Research Center, Moccasin, MT, 2018)

Statistical analysis includes cultivars not listed
Spring canola variety trial results, oil content (%)
Cultivars yielding statistically equivalent to 2018 top performer, 4187 RR (Central Ag Research Center, Moccasin, MT, 2018)

Statistical analysis includes cultivars not listed
4187 RR

- Supplier: BrettYoung
- Herbicide Resistance: Roundup Ready
- Resistant to:
  - Blackleg
  - Clubroot
- Among the top performers for:
  - Establishment
  - Plant Height
  - Test Weight
DKL 70-10

• Supplier: Dekalb
• Herbicide Resistance: Roundup Ready
• Resistant to:
  • Blackleg
• Among the hybrids exhibiting the least frost damage in 2017
6074 RR

• Supplier: BrettYoung
• Herbicide Resistance: Roundup Ready
• Resistant to:
  • Blackleg
• Among the top performers for:
  • Establishment
  • Test Weight
  • Oil Content
11H4030

• Supplier: Cargill
• Herbicide Resistance: Roundup Ready
• Resistant to:
  • Blackleg
  • Fusarium
• Earliest flowerer
• Among the top performers for:
  • Establishment
  • Test Weight
HyCLASS 955

• Supplier: CROPLAN by WinField
• Herbicide Resistance: Roundup Ready
• Resistant to:
  • Blackleg
  • Clubroot
• Among the top performers for:
  • Establishment
  • Test Weight
  • Oil Content
HyCLASS 930

- Supplier: CROPLAN by WinField
- Herbicide Resistance: Roundup Ready
- Resistant to:
  - Blackleg
- Among the top performers for:
  - Establishment
  - Test Weight
  - Oil Content
C5507

- Supplier: Cibus
- Herbicide Resistance: Sulfonylurea
- Resistant to:
  - Blackleg
- Among the top performers for:
  - Plant Height
  - Oil Content
HyCLASS 730

- Supplier: CROPLAN by WinField
- Herbicide Resistance: Roundup Ready
- Resistant to:
  - Blackleg
- Among the top performers for:
  - Establishment
  - Test Weight
  - Oil Content
5545 CL

• Supplier: BrettYoung
• Herbicide Resistance: Clearfield
• Resistant to:
  • Blackleg
• Among the top performers for:
  • Plant Height
Understanding Acidification and Management of Montana Soils

(Pg. 68)
Background

Soil acidity in Montana can be traced to:

1. Increasing N fertilizer consumption (3x since 1980s)
   - Microbial oxidation (i.e., nitrification) releases protons (H\(^+\)) and increases soil acidity

2. Adoption of no-till
   - Absence of tillage eliminates mixing with higher pH soil layers below
Background

Growth of soil acidity in Montana soils since 1995

Credit: Dr. Rick Engel; Source: AgVise Laboratories
Background

Percentage of soil samples with pH < 6.5 by zip code region

Credit: Dr. Rick Engel; Source: AgVise Laboratories
Methods

• 9 cultivars of:
  • Spring canola
  • Spring pea
  • Spring wheat
  • Spring barley
• Limed (5 ton/ac) and unlimed conditions
• Two locations:
  • Near Highwood (soil pH < 4.5)
  • Near Fort Benton/Geraldine (not summarized)
Results

• The potential for lime application to boost test weights is crop-dependent \((P < 0.1)\)

• There is good potential for lime applications to boost spring pea yields, spring canola yields, and spring canola test weights, though these responses were cultivar dependent \((P < 0.05)\)

• ROI of lime application in spring pea and spring canola systems with acidic soils may be increased with careful selection of cultivars

• A formal assessment of cultivar-specific tolerance to soil acidity is ongoing
Response to sugar beet lime in cultivars of spring canola grown in acidic soils, yield (lb/ac)
Highwood, MT, 2018

*Identifier omitted at request of breeder
Response to sugar beet lime in cultivars of spring pea grown in acidic soils, yield (lb/ac)

Highwood, MT, 2018
Top-yielders
(Central Ag Research Center, Mocassin, MT, 2018)

Spring Pea
• Nette 2010
• Hampton
• Jetset
• Delta
• Navarro
• AAC Carver
Top-yielders
(Central Ag Research Center, Moccasin, MT, 2018)

Spring Lentil
  • Avondale
  • CDC Maxim
Top-yielders
(Central Ag Research Center, Moccasin, MT, 2018)

Spring Chickpea
- CDC Orion
- CDC Palmer
- CDC Frontier
- Nash
- CDC Leader
Top-yielders
(Central Ag Research Center, Moccasin, MT, 2018)

Spring Canola
- 4187 RR
- DKL 70-10
- 6074 RR
- 11H4030
- HyCLASS 955
- HyCLASS 930
- C5507
- HyCLASS 730
- 5545 CL
Tolerance to Acidic Soils

• Look for formal assessment in next year’s report or check CARC’s website for updates:

Link to CARC’s website: http://agresearch.montana.edu/carc/
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References:

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United States Department of Agriculture Agricultural Marketing Service https://www.ams.usda.gov/