Pulse crop variety update

January 30, 31 – February 1, 2 2017

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**Goals in Pulse Breeding**

- Increase yield and stability
- Grower satisfaction/Lower production cost – disease resistance, lodging resistance, herbicide tolerance, etc
- Consumer satisfaction – colour, size, appearance, nutrition, reasonable cost

*Rapid introduction of new technologies and ideas that allow us to increase/maintain genetic AND economic gains*
LENTIL and FABA BEAN
Breeding Program Changes

• All new varieties have “PBR applied for” status since 2014 ....
• All lentils will have imidazolinone tolerance from now on....
• All white-flowered faba bean with low vicine/convicine from 2017 onward...
LENTIL BREEDING RESEARCH

Main limitations:
Greenhouse, growth room and seed handling facilities appropriate for scope and scale of breeding objectives

Canada produces 50% of global lentils....
- More expectations...
- More problems...
- IYOP increase demand for seed overseas...

Data Courtesy of SCIC (2016)
## Newer Red Lentils

<table>
<thead>
<tr>
<th>Market class</th>
<th>Variety</th>
<th>Herbicide Tolerance</th>
<th>Years Tested *</th>
<th>Yield % CDC Maxim CL</th>
<th>Maturity Rating</th>
<th>Resistance to: Ascochyta Blight</th>
<th>Seed Weight (g/1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small red</td>
<td>CDC Maxim</td>
<td>CL</td>
<td>10</td>
<td>100 100</td>
<td>E/M G G</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CDC Dazil</td>
<td>CL</td>
<td>9</td>
<td>104 98</td>
<td>E/M G F</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CDC Impulse</td>
<td>CL</td>
<td>7</td>
<td>108 95</td>
<td>E/M G G</td>
<td>44</td>
<td></td>
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<tr>
<td></td>
<td>CDC Proclaim</td>
<td>CL</td>
<td>6</td>
<td>105 101</td>
<td>E/M G G</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Extra small red</td>
<td>CDC Redmoon</td>
<td>CL</td>
<td>6</td>
<td>115 102</td>
<td>E/M G G</td>
<td>41</td>
<td></td>
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<tr>
<td></td>
<td>CDC Roxy</td>
<td></td>
<td>6</td>
<td>103 102</td>
<td>E/M G G</td>
<td>32</td>
<td></td>
</tr>
</tbody>
</table>

* Co-op and Regional Trials in Saskatchewan since 2006. Comparisons to the check variety, small red lentil CDC Maxim CL.

CL indicates Clearfield variety.

Maturity ratings: Normal maturity range in days based on May 1 seeding is E = 100, VL = 110 but maturity can be much earlier in dry years, much later in cool wet years. See Page 2 for more information on maturity range in lentil.

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## LENTIL PERFORMANCE 2015 vs 2016

2015 – super dry

2016 – super wet

*Need to take this into account, more prudent to use 3 year or longer data!*
### CDC Redmoon (Market Class: Small Red (Conventional type))

**Variety name:** (Registration Test ID: 3646-4) **(CDC Redmoon)**

**Yield advantage:** 113% of CDC Maxim (37 sites)
- 2015 – 8 sites – 112% of CDC Maxim; 2016 - 8 sites, 110% of CDC Maxim still looking good....

**Maturity rating:** early to medium

**Disease ratings:** Good for ascochyta and anthracnose

**Quality attributes:** similar to CDC Maxim (40 g), seed a bit more plump

**Other agronomic traits:** similar to CDC Maxim

- **Year of release:** 2015

### CDC Proclaim (Market Class: Small Red (Clearfield type))

**Variety name:** (Registration Test ID: IBC 550) **CDC Proclaim**

**Yield advantage:** 105% of Maxim (47 sites – 5 years, consistent across years)
- In 2015 – 8 sites, 103% of CDC Maxim; 2016 - 8 sites, 108% of CDC Maxim

**Maturity rating:** early to medium

**Disease ratings:** Similar to CDC Maxim

**Quality attributes:** seed size 40g same as CDC Maxim

- **Year of release:** 2014
**Market Class: Small Red (Clearfield type)**

**Variety name:** *(Registration Test ID: IBC 479)* **CDC Impulse**

- **Yield advantage:** 108% of CDC Maxim (44 site-year total)
  - *In 2015, 110% of CDC Maxim; 2016 - 8 sites, 99% of CDC Maxim*

- **Disease ratings:** Similar to CDC Maxim

- **Quality attributes:** seed size (44 g) 10% bigger than CDC Maxim

- **Other agronomic traits:** slightly taller than Maxim

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**Extra Small Red (Conventional type)**

**Variety name:** *(Registration Test ID: 3959-6)* **CDC Roxy**

- **Yield advantage:** 104% of CDC Maxim (45 site-year)
  - *In 2015 – 108% of CDC Maxim over 8 sites; 2016 - 8 sites, 97% of CDC Maxim*

- **Quality attributes:** 31 mg seed size, similar to CDC Rosetown

- **Disease ratings:** Good for ascochyta and anthracnose

- **Maturity rating:** early to medium

- **Other agronomic traits:** a little later to flower than CDC Maxim

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**Year of release:** 2014
## Newest Green Lentils.....

<table>
<thead>
<tr>
<th>Market class</th>
<th>Variety</th>
<th>Herbicide Tolerance</th>
<th>Years Tested</th>
<th>Yield % CDC Maxim CL</th>
<th>Maturity Rating</th>
<th>Resistance to: Ascochyta Blight</th>
<th>Seed Weight (g/1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small green</td>
<td>CDC Imvincible</td>
<td>CL</td>
<td>10</td>
<td>96</td>
<td>83</td>
<td>33</td>
<td>E G G 34</td>
</tr>
<tr>
<td></td>
<td>CDC Kermit</td>
<td>7</td>
<td>106</td>
<td>102</td>
<td>36</td>
<td>E/M G G</td>
<td>34</td>
</tr>
<tr>
<td>Extra small green</td>
<td>CDC Asterix</td>
<td>9</td>
<td>99</td>
<td>101</td>
<td>30</td>
<td>E G F</td>
<td>26</td>
</tr>
<tr>
<td>Medium green</td>
<td>CDC Impress</td>
<td>CL</td>
<td>6</td>
<td>87</td>
<td>71</td>
<td>34</td>
<td>M G P 52</td>
</tr>
<tr>
<td>Large green</td>
<td>CDC Imigreen</td>
<td>CL</td>
<td>7</td>
<td>78</td>
<td>71</td>
<td>44</td>
<td>M G VP 57</td>
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<tr>
<td></td>
<td>CDC Greenland</td>
<td>7</td>
<td>89</td>
<td>70</td>
<td>38</td>
<td>M/L G VP</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>CDC Greenstar</td>
<td>8</td>
<td>101</td>
<td>78</td>
<td>40</td>
<td>M/L G F</td>
<td>73</td>
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<tr>
<td></td>
<td>CDC Impower</td>
<td>CL</td>
<td>9</td>
<td>85</td>
<td>68</td>
<td>41</td>
<td>M/L G VP 64</td>
</tr>
</tbody>
</table>

All have green seed coat and yellow cotyledons

### Market Class: Small Green (Conventional type)

**Variety name:** (Registration Test ID: 3592-13) **CDC Kermit**

**Yield advantage:** 106% of CDC Maxim (37 site-year)  
(2015 – 8 sites – 107% of CDC Maxim); 2016 - 8 sites, 98% of CDC Maxim

**Maturity rating:** early to medium

**Disease ratings:** Good for ascochyta and anthracnose

**Quality attributes:** 33 g similar to CDC Imvincible

**Other agronomic traits:** similar to CDC Imvincible, bit taller?

* Year of release: 2014
Crop Kind: Lentil

Market Class: Small Red (Conventional type)

Variety name: (Registration Test ID: 3674-15) **CDC ???**

Yield advantage: 111% of CDC Maxim (52 sites)

CONSISTENT!

Maturity rating: early to medium

Disease ratings: Similar to CDC Maxim

Quality attributes: seed size similar to CDC Maxim

Other agronomic traits: a little later to flower than CDC Maxim

Year of PGDC Recommendation: 2013

2014 - PBR applied for

### LENTIL PERFORMANCE
(wet vs dry years)

3674-15 small red

<table>
<thead>
<tr>
<th>Years</th>
<th>Yield % Maxim</th>
<th>No. of Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-16</td>
<td>111%</td>
<td>52</td>
</tr>
<tr>
<td>2016</td>
<td>111%</td>
<td>8</td>
</tr>
</tbody>
</table>
Review of 2016 releases

Crop Kind: Lentil
Market Class: Small Red (Clearfield type)
Variety name: (Registration Test ID: IBC 975) CDC ???
Yield advantage: 97% of Maxim (31 sites – 3 years) NOT CONSISTENT
Maturity rating: early to medium
Disease ratings: Similar to CDC Maxim
Quality attributes: seed size same as CDC Maxim
Year of Recommendation: February 2016 PGDC
Year of Release: ?? 2016 PBR applied for... RECOMMENDATION TO DROP IT...

LENTIL PERFORMANCE (wet years)
IBC 975 small red (CL)

<table>
<thead>
<tr>
<th>Years</th>
<th>Yield</th>
<th>No. of Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>111 %</td>
<td>18</td>
</tr>
<tr>
<td>2015</td>
<td>97 %</td>
<td>31</td>
</tr>
<tr>
<td>2016</td>
<td>72 %</td>
<td>8</td>
</tr>
</tbody>
</table>

Inconsistent in “high water stress” year
Better to drop it... better ones coming
**Crop Kind:** Lentil

**Market Class:** Large Green (Clearfield type)

**Variety name:** (Registration Test ID: IBC 937 (CDC ????))

**Yield advantage:** 88% of CDC Maxim (46 sites)
Best Clearfield large green to date

**Maturity rating:** same as large

**Disease ratings:** good for ascochyta

**Quality attributes:** seed size (75 g) okay for large greens

**Other agronomic traits:** slightly taller than Viceroy

**Year of Registration/Release:** Recommended at PGDC – Feb 2016

*PBR applied for 2016*

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**LENTIL PERFORMANCE**

**IBC 937  Large green**

<table>
<thead>
<tr>
<th>Years</th>
<th>Yield % Maxim</th>
<th>No. of Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-16</td>
<td>88 %</td>
<td>46</td>
</tr>
<tr>
<td>2016</td>
<td>72 %</td>
<td>8</td>
</tr>
</tbody>
</table>
Crop Kind: Lentil

Market Class: Green Cotyledon (Clearfield type)

Variety name: (Registration Test ID: IBC 839 (CDC ????)

Yield advantage: 91 % of CDC Maxim (46 sites)
Best green cotyledon type to date

Maturity rating: same as small reds

Disease ratings: good for ascochyta

Quality attributes: seed size 35g

Other agronomic traits: slightly taller than Maxim

Year of Registration/Release: Recommended at PGDC – Feb 2016
PBR applied for 2016

### LENTIL PERFORMANCE
IBC 839 Green Cotyledon type

<table>
<thead>
<tr>
<th>Years</th>
<th>Yield % Maxim</th>
<th>No. of Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-16</td>
<td>91 %</td>
<td>46</td>
</tr>
<tr>
<td>2016</td>
<td>78 %</td>
<td>8</td>
</tr>
</tbody>
</table>
# CHICKPEA VARIETIES

## Current cultivars

<table>
<thead>
<tr>
<th>NAME</th>
<th>TYPE</th>
<th>Long term yield % Amit</th>
<th>Asco. Blight (0-9 scale)</th>
<th>Seed weight (g/1000 seeds)</th>
<th>2015 Days to maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amit</td>
<td>K</td>
<td>100</td>
<td>4.5</td>
<td>258</td>
<td>110</td>
</tr>
<tr>
<td>CDC Consul</td>
<td>D</td>
<td>112 (9)</td>
<td>4.0</td>
<td>303</td>
<td>110</td>
</tr>
<tr>
<td>CDC Orion</td>
<td>K</td>
<td>108 (10)</td>
<td>5.1</td>
<td>434</td>
<td>109</td>
</tr>
<tr>
<td>CDC Leader</td>
<td>K</td>
<td>109 (11)</td>
<td>4.5</td>
<td>390</td>
<td>107</td>
</tr>
<tr>
<td>CDC Palmer</td>
<td>K</td>
<td>109 (6)</td>
<td>4.9</td>
<td>418</td>
<td>108</td>
</tr>
</tbody>
</table>

## Percent acreage in SK

(Source SCIC)

<table>
<thead>
<tr>
<th>Name</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDC Orion</td>
<td>39</td>
<td>52</td>
<td>35</td>
</tr>
<tr>
<td>CDC Leader</td>
<td>4</td>
<td>31</td>
<td>43</td>
</tr>
<tr>
<td>CDC Frontier</td>
<td>41</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>CDC Palmer</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Amit</td>
<td>13</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>CDC Luna</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
**CDC Palmer Kabuli Chickpea**
- High yielding medium-large seeded kabuli.
- Predominantly 9 - 10 mm seed size similar to CDC Orion.
- Earlier maturing than CDC Orion.
- Moderately resistant to ascochyta blight similar to CDC Orion.

**CDC Consul Desi Chickpea**
- Desi cultivar that combines high yield, improved ascochyta blight resistance, and good seed quality.
- Plump, medium seed size with a light tan seed coat colour suitable for whole, dehulled/split seed markets and milling.
- Medium maturity.

**Main goals chickpea breeding program:**

- **Competitive advantage for farmers:**
  \[ \text{Yield} \times \text{seed size} \times \text{price} \]
  - **Yield stability**

- **Reduced risk and minimized production cost:**
  - ascochyta blight resistance; early maturity; frost tolerance

- **Ease of management:**
  - herbicide tolerance; growth habit/plant stature
FABA BEAN VARIETIES

FABA BEAN BREEDING

- Green manure types
- White flower (extraction)
- Large seeded coloured flower (traditional market)
- ALL varieties need to be low vicine
- ALL seed producers should exceed CSGA isolation requirements??
Outcrossing concerns....
**Tannins: associated with flower colour**

Tannins (polyphenolics) → Concentrated in seed hulls

Eliminated by either of 2 genes zt1 and zt2

Co-expression of white flower trait

Seed coat of white flower type:
0 to 0.6 % tannin → better digestibility of protein and a higher proportion of available energy

Seed coats of coloured flower type: 4 to 8 % tannin

Zero tannin – 310 mg

Normal tannin – 700 mg

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**CDC Released Faba bean**

<table>
<thead>
<tr>
<th>Variety</th>
<th>Years Tested*</th>
<th>Yield % CDC Fatima</th>
<th>Lodging 1 (1-9)</th>
<th>Maturity Rating (days)</th>
<th>Seed Weight (g/1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COLOURED FLOWER (NORMAL TANNIN)</strong></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>CDC Fatima</td>
<td>11</td>
<td>100</td>
<td>3.8</td>
<td>105</td>
<td>520</td>
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<tr>
<td>FB9-4</td>
<td>9</td>
<td>92</td>
<td>3.7</td>
<td>104</td>
<td>680</td>
</tr>
<tr>
<td>CDC SSNS-1</td>
<td>10</td>
<td>91</td>
<td>3.4</td>
<td>105</td>
<td>335</td>
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<td>186S-11</td>
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<td>3.1</td>
<td>106</td>
<td>749</td>
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<tr>
<td>247-13</td>
<td>4</td>
<td>107</td>
<td>3.4</td>
<td>106</td>
<td>620</td>
</tr>
<tr>
<td><strong>WHITE FLOWER (ZERO TANNIN)</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>CDC Snowdrop</td>
<td>8</td>
<td>94</td>
<td>2.6</td>
<td>104</td>
<td>335</td>
</tr>
</tbody>
</table>

* Lodging score (1-9) where 1 = completely upright, 9 = completely lodged
**Crop Kind:** Faba bean – *(potential release)*

**Market Class:** white flower, small-seeded

<table>
<thead>
<tr>
<th>Variety name</th>
<th>Registration Test ID: 219-16</th>
</tr>
</thead>
</table>

**Yield advantage:** 99% of Snowbird (46 sites – 6 years) (Snowdrop = 90%)

**Maturity rating:** similar to Snowbird

**Seed weight:** smaller than Snowbird; slightly larger than Snowdrop

**Quality attributes:** *(under evaluation)* NOT LOW VICINE

**Agronomic traits:** lodging score better than checks; similar height as checks

**Year of Registration/Release:**
- 2015 registration recommendation
- 2016 release? – NOT ENOUGH SEED
- 2017 release? – DEPENDS ON SEED SUPPLY

**NOTE:** PROGRAM SWITCHING TO LOW VICINE ONLY AS QUICKLY AS POSSIBLE

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**Snowbird**

- 436 g/1000 seeds

**219-16**

- 360 g/1000 seeds

**CDC Snowdrop**

- 335 g/1000 seeds
Acknowledgments:

CSFL Pulse Breeding Staff
Kernen Breeder Seed Facility Staff
Pulse Genetic Lab
Pulse Pathology Research Group
Cooperators