**AAC Royce field pea**

<table>
<thead>
<tr>
<th><strong>Journal:</strong></th>
<th><em>Canadian Journal of Plant Science</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manuscript ID:</strong></td>
<td>CJPS-2016-0175.R3</td>
</tr>
<tr>
<td><strong>Manuscript Type:</strong></td>
<td>Cultivar description</td>
</tr>
<tr>
<td><strong>Date Submitted by the Author:</strong></td>
<td>22-Sep-2016</td>
</tr>
<tr>
<td><strong>Complete List of Authors:</strong></td>
<td>Bing, Dengjin; Agriculture and Agri-Food Canada, Beauchesne, Don; Agriculture and Agri-Food Canada, McLaren, Debra; AAFC, Vera, Cecil; Agriculture and Agri-Food Canada, Research Branch</td>
</tr>
<tr>
<td><strong>Keywords:</strong></td>
<td>field pea, Pisum sativum, powdery mildew resistance</td>
</tr>
</tbody>
</table>
AAC Royce field pea

Deng-Jin Bing1*, Don Beauchesne1, Debra McLaren2, and Cecil Vera3

1Agriculture and Agri-Food Canada, 6000 C & E Trail, Lacombe, Alberta, Canada T4L 1W1;  
2Agriculture and Agri-Food Canada, P.O. Box 1000A, R.R.#3, Brandon, Manitoba, Canada R7A 5Y3;  
3Agriculture and Agri-Food Canada, P.O. Box 1240, Melfort, Saskatchewan, Canada S0E T4L

* Corresponding author, phone: 403-782-8875; fax: 403-782-6120; email: Dengjin.bing@agr.gc.ca

Short title: AAC Royce field pea

Bing, D.J., Beauchesne, D., McLaren, D., and Vera, C. Year. AAC Royce field pea. Can. J. Plant Sci. Vol x: page-page. AAC Royce is a semi-leafless, green cotyledon field pea (Pisum sativum L.) cultivar developed at Agriculture and Agri-Food Canada, Lacombe Research and Development Centre, Lacombe, Alberta, Canada. It has a maturity of 105 days, thousand seed weight of 254 g, and a medium lodging resistance. AAC Royce is resistant to powdery mildew (caused by Erysiphe pisi Syd.), and moderately susceptible to mycosphaerella blight (caused by Mycosphaerella pinodes) and fusarium wilt (caused by Fusarium oxysporum). AAC Royce is adapted to all field pea growing regions in western Canada.

Key words: field pea, Pisum sativum L., powdery mildew resistance

AAC Royce is a semi-leafless, green cotyledon field pea (Pisum sativum L.) cultivar developed at Agriculture and Agri-Food Canada, Lacombe Research and Development Centre, Lacombe, Alberta, Canada. It has a maturity of 105 days, thousand seed weight of 254 g, and a medium
lodging resistance. AAC Royce is resistant to powdery mildew (caused by *Erysiphe pisi* Syd.), and moderately susceptible to mycosphaerella blight (caused by *Mycosphaerella pinodes*) and fusarium wilt (caused by *Fusarium oxysporum*). AAC Royce is adapted to all field pea growing regions in western Canada. AAC Royce was registered on 18 December 2014 at the Variety Registration Office, Canadian Food Inspection Agency. The registration number was 7624.

**Breeding Methods and Pedigree**

AAC Royce was developed from the cross Stratus/DS4-0459.055. Stratus, developed by Innoseeds B.V., Vlijmen, Netherlands, was a green pea cultivar registered in Canada. Stratus is resistant to powdery mildew caused by *Erysiphe pisi* Syd. DS4-0459.055 is a high yielding and semi-leafless but powdery mildew susceptible breeding line developed by Danisco Seed, Holeby, Denmark.

The breeding method for AAC Royce was pedigree selection in combination with single seed descent (SSD). The cross Stratus/DS4-0459.055 was made in the greenhouse at the Agriculture and Agri-Food Canada (AAFC) Morden Research and Development Centre, MB in the winter of 2001. The F$_1$ was grown in the field in Morden, MB in the summer of 2002 and bulk harvested. The F$_2$ was planted at two sites in the field in 2003 in Morden, MB. A total of 203 powdery mildew resistant plants were selected from the F$_2$ population, and advanced to the F$_3$ generation in the greenhouse at the AAFC Morden Research and Development Centre and AAFC Lacombe Research and Development Centre in the winter of 2003 using SSD. The F$_4$ generation was grown in the field in Morden, MB and Lacombe, AB in 2004, and a total of 142 single plants were harvested. Each of the harvested plants was grown in 1 m$^2$ plot in the field in 2005 in Lacombe, AB, from which 101 lines were visually selected on the basis of maturity and good
lodging resistance. The selected lines were further selected for good appropriate shape and high green color intensity, and finalized to 68 lines. The preliminary yield test of the 68 lines was conducted in Morden, MB and Lacombe, AB in 2006, and 28 lines were selected on the basis of their yield, maturity, lodging resistance and seed quality for advanced yield test, which was grown in replicated trials at eight sites (Barrhead, AB; two sites in Lacombe, AB; two sites in Morden, MB; Namao, AB; Saskatoon, SK and Swift Current, SK) in 2007. One of the 28 lines, designated as P0221-34, had high seed yield and good seed quality, and was selected for further evaluation. Line P0221-34 was grown in two 1 x 15 m strips in the field in 2008 in Lacombe, AB for seed multiplication and purification by roguing off-type plants. Line P0221-34 was entered into the 2009-2010 Western Canada Field Pea Cooperative Registration Test-A (CO-OP Test) as entry MP1880, and evaluated at a total of 20 location-years. The test locations were Fort St. John, BC; Barrhead, Namao and Lacombe, AB; Melfort, Indian Head, Outlook, Rosthern, Saskatoon and Scott SK; and Brandon and Morden, MB. The pre-breeder seed of AAC Royce was derived from a single F_8 line, and the first breeder seed was produced in the F_9.

Performance

In the pea CO-OP Test over 20 location-years, AAC Royce yielded 16% higher than the check cultivar CDC Striker and 10% higher than the check cultivar Cooper (Table 1). AAC Royce was 1 d later than CDC Striker in maturity, but 1 d earlier than Cooper. It had a plant height of 72 cm, 4 cm shorter than the check cultivars. AAC Royce had a lodging score of 4.6, higher than the check cultivars.
Other Characteristics

The seed size of AAC Royce (254 g), measured with thousand seed weight (TSW), was between that of CDC Striker (244 g) and Cooper (269 g). AAC Royce had less spherical seeds than the check cultivars. The seed coat integrity, measured with seed coat breakage, of AAC Royce (13%) was higher than that of CDC Striker (5%), but similar to Cooper (16%). AAC Royce had a bleach score of 3.3, significantly higher than CDC Striker (3.0), but similar to Cooper (3.3). Similarly, AAC Royce had lower green color intensity than CDC Striker, but it was similar to Cooper. The seed protein content of AAC Royce was 23.6%, similar to that of Cooper (23.8%), but it was significantly lower than the protein content of CDC Striker (24.9%).

AAC Royce was evaluated in 2008 and 2009 for its reactions to mycosphaerella blight (caused by *Mycosphaerella pinodes* [Berk. & Blox.] Vestergr.) in Morden, MB and Saskatoon, SK, and powdery mildew and fusarium wilt (caused by race 2 of *Fusarium oxysporum* Schlecht. emend. Snyd. & Hans. f. sp. *pisi* [van Hall] Snyd. & Hans) in Morden, MB. AAC Royce was moderately susceptible to mycosphaerella blight with an average disease infection score of 5.9, similar to the check cultivars. AAC Royce was resistant to powdery mildew, same as Cooper whereas CDC Striker was susceptible. Fusarium wilt score was rated as the percentage of wilted plants at the stage of early pod formation. AAC Royce had an average disease infection score of 23%, higher than the disease score of the check varieties, indicating the AAC Royce is susceptible to the disease. Growers may need to take disease control measures in the areas where fusarium wilt is prevalent.

Availability of Propagating Material
Breeder seed of AAC Royce is maintained at the Agriculture and Agri-Food Canada, Research Farm, Indian Head, SK, Canada, S0G 2K0. Exclusive rights for the sale and production of the pedigreed seed for commercial production have been awarded to Columbia Seed Co. Ltd., Box 80, 409 2nd Ave. South Vauxhall, Alberta, T0K 2K0, Canada.

The authors gratefully acknowledge the financial support by the Alberta Pulse Growers Commission for the development of AAC Royce.
Table 1. Agronomic performance, seed quality and disease resistance of AAC Royce and the check cultivars in the 2009-2010 Field Pea Co-operative Registration Test

<table>
<thead>
<tr>
<th></th>
<th>Yield (kg ha(^{-1}))</th>
<th>DTM (^{a}) (d)</th>
<th>Height (^{b}) (cm)</th>
<th>PHL (^{c}) (1-9)</th>
<th>TSW (^{d}) (g)</th>
<th>Shape (^{e}) (1-5)</th>
<th>SCB (^{f}) (%)</th>
<th>Bleach (^{g}) (1-5)</th>
<th>GCI (^{h}) (1-5)</th>
<th>Protein (^{i}) (%)</th>
<th>MB (^{j}) (1-9)</th>
<th>PM (^{k}) (1-9)</th>
<th>FW (^{l}) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAC Royce</td>
<td>5768</td>
<td>105</td>
<td>72</td>
<td>4.6</td>
<td>254</td>
<td>3.5</td>
<td>13</td>
<td>3.3</td>
<td>3.9</td>
<td>23.6</td>
<td>5.7</td>
<td>0.0</td>
<td>23</td>
</tr>
<tr>
<td>CDC Striker (CK)</td>
<td>5265</td>
<td>104</td>
<td>76</td>
<td>3.5</td>
<td>244</td>
<td>1.9</td>
<td>5</td>
<td>3.0</td>
<td>3.5</td>
<td>24.9</td>
<td>5.7</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Cooper (CK)</td>
<td>5378</td>
<td>106</td>
<td>76</td>
<td>3.9</td>
<td>269</td>
<td>3.2</td>
<td>16</td>
<td>3.3</td>
<td>3.9</td>
<td>23.8</td>
<td>5.3</td>
<td>0.0</td>
<td>16</td>
</tr>
<tr>
<td>LSD ((p=0.05))</td>
<td>264</td>
<td>1</td>
<td>3</td>
<td>0.5</td>
<td>6</td>
<td>0.2</td>
<td>3</td>
<td>0.2</td>
<td>0.2</td>
<td>1</td>
<td>1.0</td>
<td>-</td>
<td>12</td>
</tr>
<tr>
<td>Location-year</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>12</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Note:

\(^{a}\) Days to maturity.

\(^{b}\) Plant height (cm).

\(^{c}\) Pre-harvest lodging score, 1 = upright, 9 = prostrate.

\(^{d}\) Thousand seed weight (g).

\(^{e}\) Seed shape, 1 = round, 5 = cubed.
Seed coat breakage (%).

Bleach of cotyledons, 1 = less bleached than CDC Striker, 3 = equal to CDC Striker, 5 = more bleached than CDC Striker.

Green color intensity of cotyledons, 1 = more intensive than CDC Striker, 3.5 = equal to CDC Striker, 5 = less intensive than CDC Striker.

Protein content of seeds (%).

Mycosphaerella blight, 1 = no disease, 9 = whole plant severely blighted.

Powdery mildew, 1 = no disease, 9 = whole plant severely mildewed.

Fusarium wilt, percentage of the wilted plants.