## AAC Argosy navy dry bean

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<td>AAC Argosy, navy bean, high yield, disease resistance</td>
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</table>
CULTIVAR DESCRIPTION

AAC Argosy navy dry bean

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Abstract: AAC Argosy is a high yielding navy bean (*Phaseolus vulgaris* L.) cultivar with an upright, indeterminate bush growth habit, large seed size (23 g 100 seeds⁻¹), and resistance to common bacterial blight and race 1 and 15 of bean common mosaic virus. AAC Argosy is recommended for dry bean growing areas with 2600 or more crop heat units in Ontario, Canada.

Key words: AAC Argosy, navy bean, high yield, resistance to common bacterial blight.

AAC Argosy is a high yielding navy bean (*Phaseolus vulgaris* L.) cultivar with a large seed size, medium-late maturity and resistance to common bacterial blight. It was developed by the collaborative Agriculture and Agri-Food Canada (AAFC)/University of Guelph Dry Bean Breeding Program. AAC Argosy was tested in the Ontario Navy Bean Registration Trial in 2014 and 2015, and registered on 18 May 2017 (Registration no. 8263) at the Variety Registration Office, Canadian Food Inspection Agency.

Pedigree and Breeding Methods

AAC Argosy, tested as ACUG 14-3, was derived from the cross OAC Rex/SWX2045 made in a growth room at the University of Guelph, ON in winter 2006. The cross was designed to improve plant architecture and resistance to common bacterial blight (CBB, caused by *Xanthomonas axonopodis pv. phaseoli* (Smith) Vauterin et al. (Vauterin et al. 1995; syn. *X. campestris* pv. *phaseoli* (Smith) Dye), while maintaining the seed quality characteristics of the navy bean market class. OAC Rex (Michaels et al. 2006) is a registered navy bean cultivar with moderate resistance to CBB. SWX2045 was a single plant selection from the cross OAC 98-2/Porrillo 1. OAC 98-2 was derived from a cross involving four navy bean cultivars Kentwood/Fleetwood//OAC
Speedvale/OAC Gryphon. Porrillo 1(PI 297288) was a black bean cultivar obtained from the International Centre for Tropical Agriculture (CIAT).

The F\textsubscript{1} generation was planted at the Elora Research Station of the University of Guelph in the summer of 2006 and was bulk harvested by hand at maturity. The successive F\textsubscript{2} to F\textsubscript{4} generations were also planted at the Elora Research Station and bulk harvested by a combine. Single plant selections were made in the F\textsubscript{5} generation at AAFC-Harrow in 2010. Selection criteria were upright plant architecture, maturity, seed type appropriate for a navy bean market class (white seed coat colour, round seed shape and a 100-seed weight of approximately 20 g) and resistance to common bacterial blight. In 2011, F\textsubscript{5:6} progeny rows were grown at Harrow, and seed yield was added to the selection criteria mentioned above. AAC Argosy was tested as W10F5-13-47180 in the preliminary and advanced yield trials in 2012 and 2013, respectively, at Elora and St. Thomas, ON. AAC Argosy was tested in the Ontario Navy Bean Registration Trial in 2014 and 2015 as ACUG 14-3 following the guidelines set by the Ontario Pulse Crop Committee (www.gobeans.ca). The Registration Trial was grown across Ontario including Elora, St. Thomas, Woodstock, Auburn, Kippen and Highbury in 2014, and Elora, St. Thomas, Woodstock, Auburn, Exeter and Winchester in 2015. For seed yield, maturity and lodging resistance, data from test locations with a coefficient of variation of < 15\% were included in the statistical analysis for assessing the performance of AAC Argosy.

AAC Argosy was planted in the greenhouse at AAFC-Harrow for purification and multiplication of disease-free seed in 2014 and the F\textsubscript{5:11} pre-breeder seed was established in Twin Falls, Idaho in summer of 2015. Sixty-three progeny-rows planted in Idaho were bulked and this F\textsubscript{12} seed formed the first breeder seed.
Performance

YIELD: In the Ontario Navy Bean Registration Trials grown over nine station-years, AAC Argosy averaged 3,853 kg ha\(^{-1}\), which was 8% higher than the average of the check cultivars Nautica, T9905 and Rexeter (Table 1).

MATURITY: AAC Argosy had an average maturity of 108 d over the nine station-years, similar to Nautica and T9905, and two days earlier than Rexeter (Table 1).

SEED WEIGHT: The average seed mass of AAC Argosy was 23 g 100 seeds\(^{-1}\), which was slightly higher than the average of the three check cultivars (21 g).

LODGING: At maturity, AAC Argosy had lodging resistance which was slightly lower than Nautica (2.5 vs. 2.3), and significantly better than T9905 and Rexter (3.3 and 3.1, respectively, on a scale of 1 = upright plants to 5 = plants with weak stem and prostrate growth) (Table 1).

Other Characteristics

GROWTH HABIT: AAC Argosy has a type IIa (Brick and Johnson, 2004) indeterminate upright bush growth habit with short vines.

FLOWER AND SEED: AAC Argosy has a white standard and wing petals, and a white seed coat, similar to the check cultivars.

DISEASE REACTIONS: Resistance to common races of anthracnose, caused by *Colletotrichum lindemuthianum* (Sacc. & Magnus) Briosi & Cav., races 17(alpha), 23 (delta) and 73, and bean common mosaic virus ( BCMV) races 1 and 15, were conducted under controlled conditions in growth chambers after inoculation of 10 to 15 plants at AAFC-Harrow, ON. Anthracnose inoculation was done by brushing both the upper and lower surfaces of the unifoliate leaves with *C. lindemuthianum* spores (Balardin et al. 1997; Park et al. 2009). AAC Argosy was susceptible
to all three races of anthracnose similar to the check cultivars Nautica, T9905 and Rexeter (Table 1). Inoculation for BCMV was done on 10-d-old plants or when unifoliate leaves were fully expanded (Park et al. 2009). AAC Argosy was resistant to races 1 and 15 of BCMV similar to the check cultivars (Table 1). Resistance to common bacterial blight (CBB), caused by *X. axonopodis pv. phaseoli*, was assessed in the inoculated disease nursery at AAFC-Harrow where the plants were sprayed with a bacterial suspension of $10^7$ CFU mL$^{-1}$. Disease severity was assessed visually at 14 and 21 days after inoculation. AAC Argosy was resistant to CBB similar to Rexeter, whereas Nautica and T9905 were susceptible to the disease (Table 1).

**Processed Seed Quality:** Seeds of AAC Argosy and the check cultivars harvested from three locations in 2014 (St. Thomas, Auburn and Guelph) and 2015 (St. Thomas, Woodstock and Exeter) in the Ontario Navy Bean Registration Trial were subjected to canning and cooking quality assessment at the Bean Pilot Plant, AAFC-Lethbridge, AB. The percentage hard seed before cooking (i.e., after soaking) and after cooking of AAC Argosy were similar to Nautica and Lightning (Table 2), and significantly lower compared to AC Compass. All four cultivars had hydration coefficient of > 2.0 as preferred by the canning industry. Drain weight, matting and texture of AAC Argosy were similar to the check cultivars (Table 2). The appearance of canned bean seed samples, assessed on seed coat integrity and split seeds, of AAC Argosy, AC Compass and Lightning were similar, and slightly better than that of Nautica. The L* (lightness-darkness), a* (red-green) and b* (yellow-blue) values of seed colour of processed samples, determined using a CR-410 Chromameter (Konica Minolta Sensing Americas, Inc., Ramsey, NJ, USA), of AAC Argosy were similar to the check cultivars (data not shown).

**Maintenance and Distribution of Pedigreed Seed**

https://mc.manuscriptcentral.com/cjps-pubs
Breeder seed of AAC Argosy will be maintained by the AAFC Harrow Research and Development Centre, Harrow, ON. AAC Argosy has been licenced on an exclusive basis for seed production and marketing to Hensall District Co-operative (HDC), 1 Davidson Drive, P.O. Box 219, Hensall, ON, N0M 1X0 Canada.

Acknowledgements

The authors are grateful to the Ontario Bean Growers for financial support, to C. Gillard (University of Guelph, Ridgetown campus) for conducting the Ontario Cooperative White Bean Trials at the Auburn, Exeter and Highbury locations, and to Gerald Kereliuk (AAFC-Lethbridge) for technical assistance in conducting cooking and canning quality tests.

References


### Table 1. Agronomic and disease traits of the navy bean cultivar AAC Argosy and the check cultivars grown in the navy bean registration trials in Ontario in 2014 and 2015.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Yield (kg ha(^{-1}))</th>
<th>Maturity (d)</th>
<th>Lodging resistance(^a) (1–5)</th>
<th>Anthracnose(^b)</th>
<th>BCMV(^b)</th>
<th>CBB(^c)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>2014</td>
<td>2015</td>
<td>Mean</td>
<td>Race 17</td>
<td>Race 23</td>
<td>Race 73</td>
</tr>
<tr>
<td>AAC Argosy</td>
<td>4,040</td>
<td>3,667</td>
<td>3,854</td>
<td>108</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Nautica</td>
<td>3,443</td>
<td>3,140</td>
<td>3,292</td>
<td>108</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>T9905</td>
<td>3,618</td>
<td>3,659</td>
<td>3,639</td>
<td>108</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Rexeter</td>
<td>3,860</td>
<td>3,653</td>
<td>3,757</td>
<td>110</td>
<td>S</td>
<td>S</td>
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<tr>
<td>LSD(_{0.05})</td>
<td>179</td>
<td>299</td>
<td>1</td>
<td>0.2</td>
<td></td>
<td></td>
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</tbody>
</table>

\(^a\) Lodging resistance is determined at maturity using a 1 to 5 scale, from 1 = upright plants, 3 = partially upright plants, to 5 = plants lodged due to weak stem.

\(^b\) Reactions against anthracnose and bean common mosaic races were assessed after artificial inoculation in a growth chamber, R = resistant and S = susceptible.

\(^c\) Common bacterial blight (CBB) disease severity was recorded in inoculated common bacterial blight nursery in the field using a 0 to 5 scale, where 0 = no disease symptom, 1 = <5% of leaf area diseased, 2 = 5 to 10% of leaf area diseased, 3 = 10 to 25% of leaf area diseased, 4 = 25 to 50% of leaf area diseased, 5 = 50 to 100% of leaf area diseased. Cultivar with a severity rating of 0 to <2.5 was considered as resistant (R) and a severity rating of >2.5 as susceptible (S).
### Table 2. Cooking and canning quality traits of the navy bean cultivar AAC Argosy and the check cultivars grown in the navy bean registration trials in Ontario in 2014 and 2015.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Cooking quality, % Hard seed&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Canning quality</th>
<th></th>
<th></th>
<th></th>
<th>Texture (kg force)&lt;sup&gt;g&lt;/sup&gt;</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Before cooking</td>
<td>After cooking</td>
<td>HCS&lt;sup&gt;b&lt;/sup&gt;</td>
<td>HCB&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Drain weight (%)&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Matting (1 to 4)&lt;sup&gt;e&lt;/sup&gt;</td>
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<tr>
<td>AAC Argosy</td>
<td>0.9</td>
<td>0.0</td>
<td>2.3</td>
<td>2.3</td>
<td>58.2</td>
<td>1.3</td>
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<tr>
<td>AC Compass</td>
<td>8.6</td>
<td>1.0</td>
<td>2.3</td>
<td>2.3</td>
<td>59.4</td>
<td>1.0</td>
</tr>
<tr>
<td>Nautica</td>
<td>2.5</td>
<td>0.0</td>
<td>2.3</td>
<td>2.3</td>
<td>58.1</td>
<td>1.2</td>
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<tr>
<td>Lightning</td>
<td>0.0</td>
<td>0.0</td>
<td>2.3</td>
<td>2.3</td>
<td>58.5</td>
<td>1.0</td>
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<tr>
<td>LSD&lt;sub&gt;0.05&lt;/sub&gt;</td>
<td>4.1</td>
<td>0.7</td>
<td>0.1</td>
<td>0.1</td>
<td>2.2</td>
<td>0.5</td>
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<sup>a</sup>Two hundred seeds per cultivar per location were soaked in de-ionized water at room temperature for 16 h and cooked for 20 min at 97°C. Percentage hard seed was determined before and after cooking.  
<sup>b</sup>HCS, hydration coefficient after soaking: 90 g of navy bean seed was soaked for 16 h in de-ionized water at room temperature. Hydration coefficient after soaking was determined as seed weight after soaking/weight of dry seed.  
<sup>c</sup>HCB, hydration coefficient after blanching: soaked seed was blanched for 3 min at 93 °C. Hydration coefficient after blanching was determined as seed weight after blanching/weight of dry seed.  
<sup>d</sup>Drain weight (%): bean seeds were processed at 116 °C for 80 in tomato sauce. Can content was weighed and the weight of bean seed was determined after washing in tap water on a 8xmesh screen (Tyler series) positioned at a 15° angle. Percentage drain weight was determined as (weight of bean seed/weight of can content) × 100  
<sup>e</sup>Matting (clumping) of seeds was assessed on a 1–4 scale, where 1 = none, 2 = trace, 3 = slight, and 4 = moderate.  
<sup>f</sup>Appearance of seeds was assessed on a 1–4 scale, where 1 = excellent, 2 = good, 3 = acceptable, and 4 = unacceptable.  
<sup>g</sup>Texture (firmness, kg force 100 g seed<sup>–1</sup>) was determined by placing 100 g of washed drained bean in to a standard shear compression cell (CS-1) of Texture Measurement System – Touch (TMS-Touch, Food Technology Corp., Sterling, VA) and shearing them using a load cell of 255 kg force at a rate of 0.83 cm s<sup>–1</sup>. Data for texture from three locations in 2015 were lost, and therefore, were not include in the statistical analysis.