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AAC Delhi field pea

Deng-Jin Bing and Don Beauchesne

Abstract: AAC Delhi is a semi-leafless, large-seeded yellow field pea (*Pisum sativum* L.) variety developed at Agriculture and Agri-Food Canada Lacombe Research and Development Centre, Lacombe, AB, Canada. It has high yielding potential, medium maturity and good lodging resistance. AAC Delhi has the maturity of 95 d, and one-thousand-seed weight of 288 g. AAC Delhi is resistant to powdery mildew (caused by *Erysiphe pisi* Syd.) and is moderately susceptible to mycosphaerella blight (caused by *Mycosphaerella pinodes*) and fusarium wilt (caused by *Fusarium oxysporum*). AAC Delhi is adapted to all field growing regions in western Canada.

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

Résumé : AAC Delhi est une variété semi-aphylle de pois de grande culture (*Pisum sativum* L.) à grosses graines jaunes créée au centre de recherche et de développement d'Agriculture et Agroalimentaire Canada de Lacombe, en AB (Canada). Le cultivar se caractérise par un rendement potentiel élevé, une précocité moyenne et une bonne résistance à la verse. AAC Delhi parvient à maturité en 95 jours et son poids de mille graines s'élève à 288 g. La variété résiste au blanc causé par *Erysiphe pisi* Syd.) et est modérément sensible à la brûlure causée par *Mycosphaerella pinodes* ainsi qu'à la flétrissure causée par *Fusarium oxysporum*. Le cultivar AAC Delhi est bien acclimaté à toutes les régions de l'Ouest canadien consacrées à la culture du pois en pleine terre. [Traduit par la Rédaction]

Mots-clés : pois de grande culture, *Pisum sativum* L., résistance au blanc.

Introduction

Field pea (*Pisum sativum* L.) is a grain pulse crop widely grown in the world. It is a member of the Fabaceae (formerly known as Leguminosae) family. Canada has been the leading producer and exporter of field pea in the world since the mid-1990s, and produces several market classes of field pea including yellow, green, marrowfat, maple, red, dun, and forage pea. Breeding for improved field pea varieties for Canadian field pea producers is essential to maintain Canada's leadership in field pea production and export in the world. In this cultivar description, we describe AAC Delhi, a yellow pea variety developed at Agriculture and Agri-Food Canada Lacombe Research and Development Centre (AAFC LRDC). The variety was registered in the Variety Registration Office of the Canadian Food Inspection Agency on 29 Jan. 2018. The registration number is 8398.

Pedigree and Breeding Methods

AAC Delhi derived from the cross Noble//Polstead/CDC715S-4. Noble and Polstead were yellow pea varieties

developed by Innoseeds B.V., Vlijmen, the Netherlands. CDC715S-4, derived from the cross 92-46Y-PMR-1Y/MP1566, was a yellow pea breeding line developed at the Crop Development Centre, University of Saskatchewan.

The breeding method for AAC Delhi was pedigree selection in combination with single seed descent (SSD). The cross Noble//Polstead/CDC715S-4 was made in early 2007 in the greenhouse at AAFC LRDC. The F₁ and F₂ generations were grown in the field in Lacombe, AB in the summers of 2007 and 2008, respectively. A total of 150 single plants were selected from the F₂ nursery using SSD, and advanced to the F₃ generation in a winter nursery in Brawley, California, USA. from Dec. 2008 to Mar. 2009. The harvested seeds from the winter nursery were grown in the field in Lacombe, AB in the summer of 2009. The F₅ was grown in the Brawley winter nursery from Dec. 2009 to Mar. 2010. The F₆ generation was grown in the field in Lacombe, AB in the summer 2010, and 54 single plants were selected. Each of the selected single plants was grown in the field in a micro-plot

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Table 1. Agronomic performance, seed quality and disease resistance of AAC Delhi and the check (CK) cultivars in the 2015–2016 field pea co-operative registration Test-C.

	Yield (kg·ha ⁻¹)	DTM ^a (d)	Height ^b (cm)	PHL ^c (1–9)	TSW ^d (g)	Shape ^e (1–5)	Protein ^f (%)	MB ^g (1–9)	FW ^h (%)	PM ⁱ
AAC Delhi	4081	95	71	4.8	288	3.5	22.0	4.6	34	R
Agassiz (CK)	3854	95	75	4.5	234	2.5	20.8	4.7	18	R
AAC Peace River (CK)	3537	93	72	4.9	221	2.8	19.4	5.2	13	R
Least significant difference ($p = 0.05$)	164	2	2	0.4	5	0.2	0.5	1.0	13	—
Location-year	25	28	22	25	26	18	16	5	2	2

^aDays to maturity.^bPlant height (cm).^cPre-harvest lodging score, 1 = upright, 9 = prostrate.^dThousand seed weight (g).^eSeed shape, 1 = round, 5 = cubed.^fProtein content of seeds (%), determined by near-infrared (NIR) spectroscopy (0% moisture) using a FOSS near-infrared spectrophotometer Model 6500.^gMycosphaerella blight, 1 = no disease, 9 = whole plant severely blighted.^hFusarium wilt, percentage of the wilted plants.ⁱPowdery mildew, R = resistant, S = susceptible.

selection nursery consisting of 1 m² plots in 2011 along with the check varieties Agassiz and Cutlass in Lacombe, AB. Twelve lines were visually selected from the progenies of the cross Noble//Polstead/CDC715S-4 on the basis of appropriate maturity and good lodging resistance. These 12 lines were grown in a replicated preliminary yield test in 2012. One of the 12 lines, P0750-02, was tested in Brandon, MB, and selected on the basis of its high yield and lodging resistance. P0750-02 was evaluated in a replicated multi-location yield test in 2013. The test locations were Barrhead, Lacombe Letourneau, Lacombe Smirnoff, St. Albert and Vegreville AB; Melfort and Saskatoon, SK. P0750-02 was grown in 1 × 15 m strips in the field in 2014 for seed multiplication and purification. It was entered into the 2015–2016 Western Canada Field Pea Cooperative Registration Test-C (Pea CO-OP Test), and evaluated at a total of 28 location-years. The test locations in Alberta were Barrhead, Brooks, Lacombe, Morinville and Vegreville; Brandon, MB; and the test locations in Saskatchewan were Indian Head, Kamsack, Limerick, Melfort, Saskatoon, Scott, and Swift Current. Data of the tests were considered valid where the yield was equal to or greater than 1500 kg·ha⁻¹ and the coefficient of variation for yield was less than or equal to 15. The pre-breeder seed of AAC Delhi was produced from a single F₁₀ line, and the first breeder seed was produced in the F₁₁.

Performance

The performance of AAC Delhi was based on the 2015–2016 Pea CO-OP Test. AAC Delhi had high yielding potential, medium maturity and good lodging resistance. Compared to the check (CK) varieties Agassiz and

AAC Peace River, AAC Delhi yielded 6% higher than Agassiz and 14% higher than AAC Peace River (Table 1) on the average of 25 location-years. AAC Delhi had days to maturity of 95 d, similar to Agassiz, but 2 d later than AAC Peace River. It had a lodging score of 4.8, similar to the check cultivars. AAC Delhi was shorter than Agassiz and similar to AAC Peace River.

Other Characteristics

AAC Delhi is semi-leafless, has white flowers, yellow cotyledons and an opaque seed coat. The seed size of AAC Delhi, measured with thousand-seed-weight, is 288 g, substantially greater than that of Agassiz (234 g) and AAC Peace River (221 g). AAC Delhi has less spherical seeds than Agassiz and AAC Peace River. The protein content of AAC Delhi was 22.0%, and was 1.2% and 2.6% higher, respectively, than that of Agassiz and AAC Peace River.

AAC Delhi was evaluated in 2015 and 2016 for its reactions to mycosphaerella blight [caused by *Mycosphaerella pinodes* (Berk. & Blox.) Vesterg.] in Morden, MB and Saskatoon, SK, powdery mildew (caused by *Erysiphe pisi* Syd.), 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 Delhi was moderately susceptible to mycosphaerella blight with an average disease severity score of 4.6, similar to the check cultivars. AAC Delhi had an average disease infection score of 34% for fusarium wilt, significantly higher than Agassiz (18%) and AAC Peace River (13%). It is resistant to powdery mildew, same as the check cultivars.

Maintenance and Distribution of Pedigreed Seed

Breeder seed of AAC Delhi is maintained at the Agriculture and Agri-Food Canada, Research Farm, Indian Head, SK S0G 2K0, Canada. Exclusive rights for the commercial production of AAC Delhi have been awarded to SeedNet Inc., P.O. Box 1062, Lethbridge, AB, T0J 4A2, Canada.

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