### OAC Brooke Soybean

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<td>Keywords:</td>
<td><em>Glycine max</em> (L.) Merr., Soybean, Cultivar Description, Food-grade</td>
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CULTIVAR DESCRIPTION

OAC Brooke Soybean

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Abstract: OAC Brooke is an indeterminate food-grade soybean (Glycine max [L.] Merr.)
cultivar with high yield potential and high seed protein concentration. OAC Brooke is adapted to
and recommended for soybean growing regions in southwestern Ontario with 3050 or greater
crop heat units. OAC Brooke has a relative maturity of 2.2.

Key words: Glycine max (L.) Merr., soybean, cultivar description, food-grade

OAC Brooke is a food-grade soybean with high yield potential, high protein concentration, and
good lodging resistance that was developed at the University of Guelph, Ridgetown Campus,
Ridgetown, ON, Canada. OAC Brooke is intended for the soybean growing regions with 3050 or
more crop heat units (CHU). Certificate of Eligibility for Certification no. 1568-2012 was issued
for SC 3809 (OAC Brooke) by the Canadian Seed Growers’ Association on 25 February 2013.
Pedigree and Breeding Methods

OAC Brooke is a F₄-derived indeterminate soybean cultivar developed from a cross between RCAT Pinehurst and A01-409031 made in 2004. RCAT Pinehurst (pedigree: S14H4 x Ivory) is a food-grade soybean adapted to southwestern Ontario with relative maturity (MG) of 2.3 [US Maturity Group Classification (Johnson, 1987)]. RCAT Pinehurst was developed at the University of Guelph, Ridgetown Campus, ON, Canada. A01-409031 (pedigree: A97-874007 x AgriPro AP1995) is a high protein conventional soybean that is adapted to MG 1 and was developed at the Iowa State University, Ames, IA, USA.

The F₁ seeds were grown in a growth room, at the University of Guelph, Guelph Campus, ON, to the first trifoliolate leaf stage and transplanted to a field at the Ridgetown Campus in the spring of 2004. The F₂ and F₃ populations were advanced using the modified single-seed descent method, in which one pod was harvested from each plant and their seeds were saved for replanting, in a winter nursery in Costa Rica during 2004 – 2005. The F₄ generation was spaced-planted at Ridgetown, ON, in 2005, and single plants were selected on the basis of maturity and visual agronomic performance to form F₄:5 lines. These lines were grown in 4-meter plant rows at Ridgetown, ON, in 2006, and selected for the same agronomic characteristics in addition to lodging resistance, bottom pod and plant height. A selection intensity of approximately 15% was used to select among the plant rows. The breeding line SC 3809 was formed by bulking a single F₄:6 row and evaluated for yield and important agronomic and seed quality traits, including seed size, oil and protein concentrations, in preliminary yield trials at two locations, Ridgetown and Inwood, in 2007. SC 3809 was further entered into advanced yield trials at three locations, Ridgetown, Inwood, and Palmyra, for two years prior to its entry into Early Maturity Group 2.
(EMG 2) of Ontario Soybean Trials (OST) in 2010. Selection intensities of 12% were applied to select among both F$_4$:6 and F$_4$:7 lines.

Seeds of individual F$_4$:8 plants were evaluated for morphological uniformity, in 2009, and 50 plant rows were grown and purified to establish Pre-Breeder Seed. Breeder seed was produced by bulking seeds of 11 uniform plots of F$_4$:9 plants in 2010.

**Performance**

OAC Brooke was entered as SC 3809 into the 3100 CHU (EMG 2) sites of OST conducted by Ontario Soybean and Canola Committee (OSACC) in 2010, and its agronomic and seed quality traits were evaluated over 60 environments on clay (Inwood and Palmyra) and loam (Ridgetown) soil types from 2010 to 2015. The experimental design was randomized complete block design with three or four replications per site. Test sites with coefficients of variation (CVs) lower than 15% are considered valid tests. The field plots were evaluated and rated for seed yield and size, plant height, lodging, and maturity date. Seed yield was measured as kilogram per hectare and was adjusted to 13% moisture. Seed size was determined by weighing 100 seed samples from each entry. Plant height, as the average distances from the soil surface to the apex of the main stem, was measured at maturity. Lodging was visually scored at maturity for all plots on a scale of 1 = all plants standing erect and 5 = all plants prostrate. Maturity date was determined as the number of days from planting to when approximately 95% of the plots had reached mature pod colour (Fehr et al., 1971).

OAC Brooke is classified as a 3050-CHU (MG 2.2) cultivar adapted to southwestern Ontario. Across the 60 site-years, the average yield for OAC Brooke was 4200 kg ha$^{-1}$, which was 2.4% higher than the highest yielding check cultivar Mersea (Poysa et al., 2010) and significantly out-
yielded the two other check cultivars OAC Kent and SG 2311 (Table 1). Across these environments, OAC Brooke, on average, matured 120 days after planting, which was one day later maturing than SG 2311 and two days later than OAC Kent and Mersea (Table 1). OAC Brooke, with the average height of 81.8 cm, was significantly shorter than all the checks and had better lodging resistance than OAC Kent (Table 1). Across 18 environments, the average 100-seed weight of OAC Brooke was 22.0 grams, which was significantly greater than that of the checks (Table 1). Across these environments, the protein concentration of OAC Brooke was not significantly different from that of the checks, but its oil concentration was lower than that of Mersea and OAC Kent (Table 1).

Other Characteristics

OAC Brooke has an indeterminate growth habit with white flowers, green hypocotyls, brown pods, and grey pubescence. The seeds are spherical rounded with yellow seed coat and hilum.

Maintenance and Distribution of Pedigree Seed

Breeder seed of OAC Brooke is maintained by the Department of Plant Agriculture, Ridgetown Campus, University of Guelph, Ridgetown, ON, Canada N0P 2C0. Pedigreed seed is distributed through SeCan, 501-300 March Rd., Kanata, Ontario, Canada K2K 2E2. SeCan has exclusive rights to OAC Brooke soybean cultivar for contract production of pedigreed seed for use in contract production.
Acknowledgements

The authors acknowledge the technical assistance of the late Julia Zilka from the University of Guelph for making the crosses. The development of this variety was made possible through generous funding support by the Grain Farmers of Ontario (GFO) and SeCan.


### Table 1. Seed yield, seed composition, and agronomic performance of OAC Brooke, OAC Kent, Mersea, and SG 2311 in Ontario Soybean Trials during 2010-2015

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Yield(^y) (kg ha(^{-1}))</th>
<th>Maturity(^x) (d)</th>
<th>Protein(^w) (g kg(^{-1}))</th>
<th>Oil(^w) (g kg(^{-1}))</th>
<th>Weight(^y) (g 100 seed(^{-1}))</th>
<th>Height (cm)</th>
<th>Lodging (1-5)(^v)</th>
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<tbody>
<tr>
<td>OAC Brooke</td>
<td>4200</td>
<td>120</td>
<td>428</td>
<td>204</td>
<td>22</td>
<td>81.8</td>
<td>1.2</td>
</tr>
<tr>
<td>Mersea</td>
<td>4100</td>
<td>118</td>
<td>423</td>
<td>209</td>
<td>20.3</td>
<td>87.4</td>
<td>1.3</td>
</tr>
<tr>
<td>OAC Kent</td>
<td>3910</td>
<td>118</td>
<td>424</td>
<td>218</td>
<td>20.7</td>
<td>87.5</td>
<td>1.9</td>
</tr>
<tr>
<td>SG 2311</td>
<td>4010</td>
<td>119</td>
<td>429</td>
<td>203</td>
<td>20.4</td>
<td>86.8</td>
<td>1.4</td>
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<tr>
<td>LSD(_{(α=0.05)})</td>
<td>170.2</td>
<td>2.4</td>
<td>6.2</td>
<td>3.5</td>
<td>1.02</td>
<td>3.61</td>
<td>0.43</td>
</tr>
<tr>
<td>No. of sites</td>
<td>60</td>
<td>60</td>
<td>18</td>
<td>18</td>
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<td>60</td>
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\(^1\)Performance based on 60 trials conducted at Inwood, Palmyra, and Ridgetown during 2010-2015.

\(^2\)Seed yield and weight on a 13% moisture basis.

\(^3\)Number of days from planting to when 95% of the pods reach mature pod colour.

\(^4\)Seed protein and oil concentration on a nil moisture basis by near infrared spectroscopy.

\(^5\)Visual score with 1 designated as plants standing erect and 5 as plants prostrate.

\(^6\)Least significant difference at 95% confidence level.