OAC Prosper Soybean

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CULTIVAR DESCRIPTION

OAC Prosper Soybean

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Abstract: OAC Prosper is a semi-determinate food-grade soybean (\textit{Glycine max} [L.] Merr.)
cultivar with high yield potential, high seed protein concentration, and resistance to SCN. OAC
Prosper is developed and recommended for soybean growing areas in southwestern Ontario with
2950 or greater crop heat units. OAC Prosper has a relative maturity of 1.8.

Key words: \textit{Glycine max} (L.) Merr., soybean, cultivar description, food-grade, SCN-resistant

OAC Prosper is a food-grade soybean with excellent yield potential and lodging resistance along
with high protein concentration that is resistant to soybean cyst nematode (SCN). OAC Prosper
was developed at the University of Guelph, Ridgetown Campus, Ridgetown, ON, Canada, and is
intended for soybean growing areas with 2950 or more crop heat units (CHU). Certificate of
Eligibility for Certification no. 1839-2015 was issued for SC 7512N (OAC Prosper) by the
Canadian Seed Growers’ Association on 8 December 2015.
Pedigree and Breeding Methods

OAC Prosper is a F₄-derived semi-determinate soybean cultivar developed from SV90-3 MFA/06 × HDC Goshen cross made in an indoor growth room at the University of Guelph, Guelph Campus, in 2007. SV90-3 MFA/06 (pedigree: RG 09 × RG 27) is a conventional experimental soybean line with relative maturity (MG) of 2.0 [US Maturity Group Classification (Johnson, 1987)]. SV90-3 MFA/06 was developed at the University of Guelph, Ridgetown Campus. HDC Goshen (pedigree: IA1008 × RCAT 9910) is a SCN-resistant food-grade soybean with high protein content and relatively large seed size that is adapted to maturity group 1 zone and was developed at the Ridgetown Campus.

The F₁ seeds from the cross between SV90-3 MFA/06 and HDC Goshen were grown in a growth room, at the Guelph Campus, to the first trifoliolate leaf stage and transplanted to an F₁ nursery at the Ridgetown Campus during 2007. 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 2007 – 2008. The F₄ generation was spaced-planted in an F₄ nursery at Ridgetown in 2008, and single plants were harvested on the basis of maturity and visual agronomic performance to select F₄:5 lines. These lines were grown in 4-meter plant rows at Ridgetown, in 2009, and selected for the agronomic characteristics listed above in addition to, lodging resistance, plant height, and bottom pod height. A selection intensity of approximately 20% was applied to select among the F₄:5 lines.

The breeding line SC 7512N was formed by bulking a single F₄:6 row that were grown at Ridgetown. The line evaluated for yield, agronomic traits, and seed quality traits, including seed size and oil and protein concentrations, in preliminary yield trials at two locations, Inwood and Ridgetown, in 2010. SC 7512N was subsequently entered into advanced yield trials at three locations.
locations, Inwood, Ridgetown, and Palmyra, for two years prior to its entry into Early Maturity Group 2 (EMG 2) of the Ontario Soybean Trials (OST) in 2013.

Seeds of individual F$_{4:8}$ plants were evaluated for morphological uniformity, in 2012, and 55 plant rows were grown and purified to establish Pre-Breeder Seed. Breeder seed was produced by bulking seeds of 14 uniform plots of F$_{4:9}$ plants in 2013.

**Performance**

OAC Prosper was entered as SC 7512N into the 3100 CHU (EMG 2) locations of OST conducted by Ontario Soybean and Canola Committee (OSACC) in 2013. The agronomic and seed quality traits were evaluated over 6 location-years on clay (Inwood and Palmyra) and 3 location-years on loam (Ridgetown) soil types from 2013 to 2015. The experimental design was randomized complete block design with three replications per location. Test locations 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 and lodging, and maturity date. Seed yield was measured as kilogram per hectare and was adjusted to 130 g kg$^{-1}$ 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 Prosper is classified as a 2950-CHU (MG 1.8) cultivar adapted to southwestern Ontario. Across 27 environments of the EMG 2 OSTs during 2013 to 2015, the average yield for OAC Prosper was 3910 kg ha$^{-1}$, which was 5.6% higher than the highest yielding check cultivar AAC
Malden (Poysa et al., 2013) with no statistically significant difference between the two cultivars. However, OAC Prosper significantly out-yielded the two other check cultivars OAC Goshen and S18-R6 (Table 1). Across these environments, OAC Prosper, on average, matured 120 days after planting, which was nine days earlier than AAC Malden (129 days) and one and three days later than S18-R6 and HDC Goshen, respectively (Table 1). OAC Prosper, with the average height of 76.9 cm, was significantly shorter than AAC Malden (84.0 cm) which may confer better stalk strength (Table 1). Across 9 environments, the protein and oil concentration of OAC Prosper were 439 g kg\(^{-1}\) and 199 g kg\(^{-1}\), respectively (Table 1).

**Disease Response**

OAC Prosper is a SCN-resistant cultivar that inherited SCN resistance from PI 88788 through its parent HDC Goshen. In controlled environment and replicated root inoculations with SCN cysts, OAC Prosper showed high level of resistance to SCN, with a female index (FI) of 8.0%, compared to 100% and 3.1% for Lee 74 (Susceptible check) and PI 88788, respectively. The high level of SCN resistance in OAC Prosper should provide a yield advantage in SCN-infested environments.

**Other Characteristics**

OAC Prosper is a semi-determinate growth habit cultivar with purple flowers, yellow 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 Prosper 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 Prosper 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 Prosper, HDC Goshen, AAC Malden, and S18-R6 in Ontario Soybean Trials during 2013-2015

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Yield&lt;sup&gt;b&lt;/sup&gt; (kg ha&lt;sup&gt;-1&lt;/sup&gt;)</th>
<th>Maturity&lt;sup&gt;c&lt;/sup&gt; (d)</th>
<th>Protein&lt;sup&gt;d&lt;/sup&gt; (g kg&lt;sup&gt;-1&lt;/sup&gt;)</th>
<th>Oil&lt;sup&gt;d&lt;/sup&gt; (g kg&lt;sup&gt;-1&lt;/sup&gt;)</th>
<th>Weight&lt;sup&gt;b&lt;/sup&gt; (g 100 seed&lt;sup&gt;1&lt;/sup&gt;)</th>
<th>Height (cm)</th>
<th>Lodging (1-5)&lt;sup&gt;e&lt;/sup&gt;</th>
</tr>
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<tr>
<td>OAC Prosper</td>
<td>3910</td>
<td>120</td>
<td>439</td>
<td>199</td>
<td>19.8</td>
<td>76.9</td>
<td>1.3</td>
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<tr>
<td>HDC Goshen</td>
<td>3502</td>
<td>117</td>
<td>447</td>
<td>196</td>
<td>21.7</td>
<td>79.6</td>
<td>1.3</td>
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<tr>
<td>AAC Malden</td>
<td>3694</td>
<td>129</td>
<td>459</td>
<td>184</td>
<td>23.6</td>
<td>84.0</td>
<td>1.9</td>
</tr>
<tr>
<td>S18-R6</td>
<td>3513</td>
<td>119</td>
<td>417</td>
<td>208</td>
<td>20.4</td>
<td>73.1</td>
<td>1.2</td>
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<tr>
<td>LSD&lt;sub&gt;f&lt;/sub&gt;(&lt;i&gt;α&lt;/i&gt;=0.05)</td>
<td>288.1</td>
<td>1.6</td>
<td>4.6</td>
<td>3.4</td>
<td>1.29</td>
<td>5.04</td>
<td>0.32</td>
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<td>No. of sites</td>
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<sup>a</sup>Performance based on 27 trials conducted at Inwood, Palmyra, and Ridgetown during 2013-2015.

<sup>b</sup>Seed yield and weight on a 13% moisture basis.

<sup>c</sup>Number of days from planting to when 95% of the pods reach mature pod colour.

<sup>d</sup>Seed protein and oil concentration on a nil moisture basis by near infrared spectroscopy.

<sup>e</sup>Visual score with 1 designated as plants standing erect and 5 as plants prostrate.

<sup>f</sup>Least significant difference at 95% confidence level.