The white-seeded common bean (Phaseolus vulgaris L.) cultivar OAC Rex was developed by the Department of Plant Agriculture, University of Guelph, Guelph, Ontario. OAC Rex is a high-yielding cultivar intended for production in areas of Ontario with more than 2800 crop heat units and is the first common bean cultivar resistant to common bacterial blight (Xanthomonas axonopodis pv. phaseoli) in Ontario. Seed has acceptable cooking and canning quality.

**Key words:** Phaseolus vulgaris L., white bean, common bean, common bacterial blight, cultivar description

**Mots clés:** Phaseolus vulgaris L., haricot blanc, haricot, brûlure bactérienne commune, description de cultivar

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**OAC Rex common bean**

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Michaels, T. E., Smith, T. H., Larsen, J., Beattie, A. D. and Pauls, K. P. 2006. **OAC Rex common bean.** Can. J. Plant Sci. **86:** 733–736. OAC Rex is an upright indeterminate bush white bean (Phaseolus vulgaris L.) cultivar intended for use in areas with greater than 2800 crop heat units. It has good yield potential in either wide or narrow row production. It is resistant to races 1 and 15 of bean common mosaic virus and is the first common bean cultivar resistant to common bacterial blight (Xanthomonas axonopodis pv. phaseoli) in Ontario. Seed has acceptable cooking and canning quality.

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The white-seeded common bean (Phaseolus vulgaris L.) cultivar OAC Rex was developed by the Department of Plant Agriculture, University of Guelph, Guelph, Ontario. OAC Rex is a high-yielding cultivar intended for production in areas of Ontario with more than 2800 crop heat units and is the first common bean cultivar resistant to common bacterial blight. It was issued Registration No. 5491 on 2002 May 24 by the Registrar, Variety Registration Office, Plant Health and Production Division, Agriculture and Agri-Food Canada, Nepean, Ontario.

**Pedigree and Breeding Methods**

OAC Rex, tested as OAC 95-4, was derived from the cross HR20-728/MBE 7 made in 1988 in a growth room. HR20-728 germplasm was a selection from the cross Ex Rico 23–Are/Midnight made at Agriculture and Agri-Food Canada (AAFC) Research Centre, Harrow, ON, and was used to provide upright architecture with high podding and narrow canopy (Park et al. 1992). MBE 7 was a selection from the cross ICA Pijao/PI 440795//Ex Rico 23 and was used to provide resistance to common bacterial blight. Common bacterial blight resistance was transferred through an interspecific cross, from the Phaseolus acutifolius A. Gray line PI 440795 which had natural resistance to this disease (Parker 1985). F₀ plants were grown in the field in 1988 at the Elora Research Station (ERS), Elora, Ontario and all seeds were bulked. The F₀ to F₂ generations were advanced using the single pod descent (pod bulk) method. The F₂ and F₄ generations were grown at a winter nursery in New Zealand in the winters of 1988–1989 and 1989–1990. The F₃ generation was grown at ERS in the summer of 1989. Single plant selections for full maturity, upright plant architecture, resistance to common bacterial blight, white bean seed type and high pod number were made from space planted F₅ bulk plots in the field at ERS in 1990. F₆ selections were screened in a growth room in the winter of 1991 for common bacterial blight resistance using the multiple-pin technique and the inoculum was generated from leaves isolated from infected plants in the field (Andrus 1948). Resistant selections were grown in the field at ERS in 1991 and 1992 as F₃ and F₅ generations, respectively, and assessed for CBB resistance using the dry leaf inoculum method of Gilbertson et al. (1988). F₅ resistant lines were grown at ERS in 1993 as progeny rows and selected for the same agronomic traits as in 1990. The F₁₀ generation was grown in 1994 at the Woodstock Research station, Woodstock, Ontario, and the ERS in yield trials, where selection was for the same agronomic traits plus high seed yield under conventional and...
MATURITY AND DAYS TO FLOWER: OAC Rex had an average maturity of 97 d (based on trials over 9 yr), which is similar to OAC Gryphon and later than Vista (Table 1). Days to flower at the ERS (1995, 1997, 1998) was 46 d for OAC Rex compared with 46 for OAC Gryphon and 49 d for Vista.

SEED WEIGHT: The seed of OAC Rex at 14% moisture weighed 21.0 g 100 seed⁻¹ and is larger than either OAC Gryphon or Vista (Table 1).

Performance

YIELD: OAC Rex was out-yielded by OAC Gryphon and Vista. 90 kg ha⁻¹ and 30 kg ha⁻¹, respectively, over 9 yr (Table 1). The cultivar can be successfully produced in narrow row production with direct combining. The line OAC 95-4 was identified in these trials and entered in the Ontario Cooperative Variety Registration/Performance Trial from 1995 to 1997. One hundred plants were grown in the winter of 1997–1998 in a growth room from residual F₃ seed, and the progeny of these plants were sent to Twin Falls, Idaho, USA, for breeder seed production in 1998. Breeder seed plant rows were rouged for uniformity and trueness to type, and seed from the remaining rows were bulked to produce breeder seed.

FLOWER AND SEED COLOUR: OAC Rex has a white standard and wings, similar to Crestwood. Seeds are dull white in colour. To identify the seed coat colour genes that OAC Rex carries, it was crossed to three primary genetic tester stocks; gbv BC₃ 5-593, dj BC₃ 5-593 BC₃ e⁻ BC₃ 5-593 (Bassett 1992). For the cross between gbv 5-593 and OAC Rex the F₁ seed coat was entirely black indicating the dominance of OAC Rex at colour genes G, B, and V. For the cross between e⁻ 5-593 and OAC Rex the F₁ seed coat was entirely black indicating OAC Rex is dominant at C. For the cross between dj 5-593 and OAC Rex the F₁ seed coat was entirely matte black indicating OAC Rex is dominant at D and J. The results of the test crosses indicate that the seed coat colour genotype of OAC Rex is asp p[C]GBVJZ (Larsen 2005).

Other Characteristics

GROWTH HABIT AND LEAF SHAPE: OAC Rex is an indeterminate bush plant with erect stem (type Ia), and leaves similar in size to those of OAC Gryphon, and similar to OAC Thunder in colour (grey-green).

FLOWER AND SEED COLOUR: OAC Rex has a white standard and wings, similar to Crestwood. Seeds are dull white in colour.

Table 2. Disease reactions of OAC Rex and two checks in the Ontario Cooperative Variety Registration/Performance Trial (1995–2004)

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>BCMV²</th>
<th>Anthracnose x</th>
<th>Common bacterial blight</th>
<th>White mould x</th>
</tr>
</thead>
<tbody>
<tr>
<td>OAC Rex</td>
<td>–</td>
<td>+</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>OAC Gryphon</td>
<td>+</td>
<td>+</td>
<td>–</td>
<td>2.3</td>
</tr>
<tr>
<td>Vista</td>
<td>–</td>
<td>–</td>
<td>+</td>
<td>2.3</td>
</tr>
<tr>
<td>SE</td>
<td></td>
<td></td>
<td></td>
<td>1.0</td>
</tr>
</tbody>
</table>

²Resistance (–), susceptibility (+), NA (not known).
²BCMV, bean common mosaic virus races 1, 15.
³Anthracnose (Colletotrichum lindemuthianum) race α is equivalent to race 17 (binary system), race Δ is equivalent to race 23 (binary system), α-B (α-Brazil) is equivalent to race 89 (binary system).
⁴Common bacterial blight (Xanthomonas axonomopdis pv. phaseoli) scores are based on a scale of 0–4, where 0= resistant, 4 = susceptible. Any score over 2 is considered susceptible (+).
⁵White mould (Sclerotinia sclerotiorum) ratings are based on a scale of 1–5, where 1= very tolerant or low levels of natural infestation, 5= very susceptible.

Table 3. Cooking Quality of OAC Rex and two Checks in the Ontario Cooperative Variety Registration/Performance Trial (1995–1997)

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Panel</th>
<th>Texture</th>
<th>Drain wt</th>
<th>Hyd. coef</th>
</tr>
</thead>
<tbody>
<tr>
<td>OAC Rex</td>
<td>8.3</td>
<td>308</td>
<td>63.5</td>
<td>1.85</td>
</tr>
<tr>
<td>Centralia</td>
<td>8.7</td>
<td>311</td>
<td>63.1</td>
<td>1.90</td>
</tr>
<tr>
<td>OAC Gryphon</td>
<td>9.3</td>
<td>318</td>
<td>63.5</td>
<td>1.85</td>
</tr>
<tr>
<td>SE</td>
<td>0.9</td>
<td>40</td>
<td>1.2</td>
<td>0.04</td>
</tr>
</tbody>
</table>

⁴Panel evaluation of cooked beans based on appearance, flavour and texture using a scale of 1–15: 1, poor; 15, excellent.
⁵Texture of washed-drained canned beans measured using wire extrusion cells, plateau force (plat) and firmness (firm).
⁶Degree of clumping of canned beans as visually scored from 1 to 5: 1, no clumping; 5, over half of beans clumped.
⁷Drain weight: weight of washed-drained canned beans expressed as a percentage of unwashed-undrained weight.
⁸Hydration coefficient: amount of water absorbed by 500 g of dry beans.
⁹Based on nine trial means of cultivars.
ADDITIONAL DISEASE REACTIONS: OAC Rex was tested for resistance to bean common mosaic virus by painting ground up leaves from an infected plant on 8- to 10-d-old plants with in a growth room at the University of Guelph. OAC Rex carries the dominant form of the \( I \) gene for BCMV resistance as determined through molecular marker analysis (Larsen 2005) and is resistant to BCMV races 1 and 15 as tested by leaf inoculation. OAC Rex was tested for Antracnose (Colletotrichum lindemuthianum) in a growth room by spraying a spore suspension on 10-d-old seedlings. It was found susceptible for three races of anthracnose (\( \alpha, \Delta, \alpha\)-Brazil). OAC Rex has both leaf and pod resistance to common bacterial blight as tested in the field by high pressure sprayer at ERS (Table 3). Over a 5-yr Ontario trial for white mould (Sclerotinia sclerotiorum), OAC Rex was similar to OAC Gryphon and Vista (Table 2).

MOLECULAR MARKER STUDIES: OAC 95-4 and OAC Rex have been used in two molecular markers studies (Tar'\'an et al. 2001; Larsen 2005). Tar'\'an et al. (2001) found three
markers linked to CBB resistance in OAC 95-4, which is the line from which OAC Rex was purified. Microsatellite marker PvCTT001 (Yu et al. 2000) was found to differentiate between CBB resistant OAC Rex derived lines (MBE 7, OAC 95-4, OAC Rex-early) and CBB susceptible lines SVM Taylor Hort and OAC Seaforth (Fig. 1A). RFLP marker Bng 21 (Vallejos et al. 1992) was converted into a PCR-based cleavage amplified polymorphism marker (Murray et al. 2002), but was not exclusive to CBB-resistant lines since it also occurred in OAC Seaforth (Fig. 1B). RFLP marker Bng 71 (Vallejos et al. 1992) was converted into a single nucleotide polymorphism marker by Larsen (2005). This marker appears to be specific for OAC Rex-related lines (MBE 7, OAC 95-4 and OAC Rex-early; Fig. 1C).

**Cooking Quality:** Cooking quality was assessed at AAFC Greenhouse and Processing Crops Research Centre, Harrow, Ontario, by a panel for appearance, flavour and texture. Instrumental tests were completed for cooked bean colour and canned bean texture (Voisey 1971). A visual examination for the degree of clumping of canned beans, the drain weight of washed-drained beans and water absorption were also used to evaluate cooking quality. OAC Rex has acceptable cooking quality, similar to OAC Gryphon and Centralia (Table 3).

**Maintenance and Distribution of Pedigreed Seed**
Breeder seed of OAC Rex is maintained by the Department of Plant Agriculture, University of Guelph, Guelph, Ontario, Canada N1G 2W1. Pedigreed seed is distributed through SeCan Association, 200-57 Auriga Drive, Nepean, Ontario, Canada K2E 8B2.

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