Small Red Bean ‘OAC Rosito’

Developed by University of Guelph Dry Bean Breeding Program
Breeders: Tom Smith & K. Peter Pauls

‘OAC Rosito’ is a full season maturity small dark red bean with good yield and good harvestability. The colour of OAC Rosito is a darker red than the usual colour for the small red class and can be considered to be of a unique class.

Performance Data*

Variety	Market Class	Yield [a] (lbs/ac)	Maturity [b] (DAP)	100 Seed Weight (g)	Harvestibility
OAC Rosito	**Small Red**	**2741**	**97**	**23.4**	**2.5**
Merlot	Small Red	2678	93	37.4	2.6
Viper	Small Red	3076	94	30.9	2.4
Ruby	Small Red	2883	95	32.9	3.9

*2015 & 2016 OPCC Performance data, 4 location years, Days to Maturity, Yield and Seed Weight are 2 year averages, Adapted from GoBeans.ca Infosheets.
[a] To convert lbs/acre to t/ha divide by 893.
[b] Days to Maturity after planting maturity. Maturity rating is affected by planting date and area where variety is being grown. Varieties are rated as mature when 95% of the pods are ripe. Normally, 3-10 additional drying days are needed before the crop is dry enough for combining

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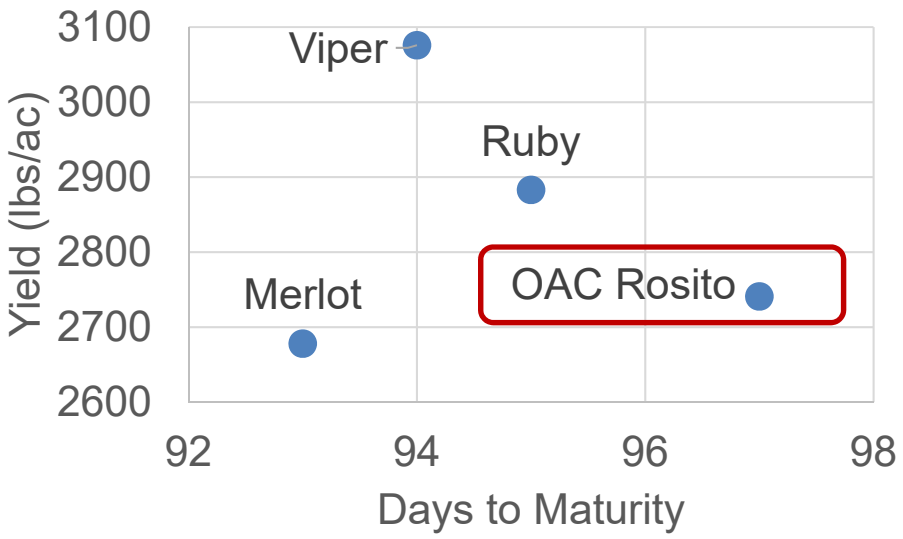
Disease Reaction [a]

Variety	BCMV		Anthracnose [b]			Common Bacterial Blight[c]
	Race 1	Race 15	Race 17	Race 23	Race 73	
OAC Rosito	**R**	**R**	**S**	**S**	**S**	**S**
Merlot	NA	NA	NA	NA	NA	S
Viper	NA	NA	NA	NA	NA	S
Ruby	NA	NA	NA	NA	NA	S

[a] R = Resistant, S = Susceptible, NA = Not Available.
[b] Anthracnose ratings, the predominant race found in Ontario is Race 73. Race 17 (binary system) is equivalent to the Alpha race, Race 23 (binary system) is equivalent to the Delta race.
[c] Resistance gene for common bacterial blight (*Xanthomonas campestris pv. phaseoli*).

Yield and Maturity*



Data from 2015 & 2016 Ontario Pulse Crop Committee Small Seeded Coloured Bean Registration Trials, 4 location years
* Adapted from GoBeans.ca Infosheets

Pedigreed seed available at:
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CULTIVAR DESCRIPTION

OAC Rosito Common Bean

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OAC Rosito is an indeterminate bush type, small red Salvadoran bean (*Phaseolus vulgaris* L.) variety with mid season maturity, good yield potential and cooking qualities.

Keywords: *Phaseolus vulgaris* L., small red Salvadoran bean OAC Rosito

Small, dark red beans are a staple Salvadoran food (Batres-Marquez et al. 2001). OAC Rosito is a high-yielding, mid season, small dark red Salvadoran bean variety that was developed at the University of Guelph, Guelph, ON, Canada and tested in the Ontario Small Coloured Bean Registration and Performance Trials. OAC Rosito was registered at the Variety Registration Office, Canadian Food Inspection Agency (CFIA), Ottawa, ON, on 2017 May 5 (Registration no. 8260).

Pedigree and Selection Methods

OAC Rosito was developed at the University of Guelph from a diverse landrace population introduced from El Salvador. Twenty single plants with upright growth habits and appropriate maturities for Ontario conditions were selected from the population. Single row plots were established from the seeds from the single plants and seeds from 8 single row selections were bulked and tested in replicated preliminary and advanced yield trials at the Elora Research Station and a field location near St. Thomas, ON, in 2011 and 2012. The yield trials were harvested with by a combine. The selection criteria for single plants and plant-rows were, high yield potential, appropriate maturity and desirable plant type with upright architecture. Seed samples of the selected single plants and plant-rows were also examined for seed size, shape and colour, and uniformity.

OAC Rosito was entered into the Ontario Small Coloured Bean Registration and Performance Trials as ACUG13-SR1 and was evaluated in multi-location yield-trials across Ontario in 2013, 2014 and 2015. These tests are performed under the guidelines set by the Ontario Pulse Crop Committee (www.gobeans.ca). Test locations with a coefficient of variation (CV) values <15% were considered valid tests and included in the statistical analysis and used for variety registration. Agronomic data i.e., yield (adjusted to 18% moisture after combine harvest), days to maturity, and seed weight (estimated for 100 seeds) were collected for each plot in each location. The data were subjected to analysis of variance to estimate least square means for each entry from each location and least significant difference (p= 0.05) between the entries. A composite seed sample was prepared from each location by mixing approximately 200 g of seed of each entry in each replication. These samples were processed in the Food Pilot Plant at Agriculture and Agri-Food Canada (AAFC), Lethbridge Research Center, Alberta and evaluated for cooking and canning quality parameters.

Plant Characteristics

OAC Rosito has an indeterminate growth habit and an upright plant type with erect stems and branches and high podding nodes with good lodging resistance. It has a slightly coloured hypocotyl and white flowers. The pods are purple coloured when ripe. The seeds are dark red with a shiny seed coat luster and a red hilum. OAC Rosito is adapted to and recommended for bean growing areas in Southwestern Ontario.

Yield and agronomic performance

OAC Rosito was compared with small seeded check cultivars, including the black bean variety ‘Zorro’ (Kelly et al. 2009), and small red bean variety ‘Merlot’ (Hosfield et al. 2004) across 6 location-years, in 2013, 2014 and 2015. OAC Rosito had similar yields to Merlot and both were significantly lower yielding than Zorro (Table 1). OAC Rosito matured in 92 to 99 days, whereas Merlot matured in 90 to 92 days. The mean 100-seed weight of OAC Rosito over three years was 21.7 g compared to 20.6 g for Zorro and 28.7 g for Merlot (Table 1). The harvestability for OAC Rosito ranged from 1.7 to 3.5 compared to Merlot, which had values from 2.0 to 3.5.

Canning and cooking quality evaluations

The hydration coefficients for OAC Rosito were significantly lower (at 2.3 and 1.9) than those measured for Merlot or Zorro in 2013 and 2014 (Table 2). OAC Rosito had matting scores that were lower or equal to the checks (Table 2). Washed drained weights for OAC Rosito were not significantly different from the checks. For the texture measurements, OAC Rosito had higher plateau force and texture firmness values than the check cultivars (Table 2). Overall, OAC Rosito had acceptable canning and cooking characteristics.

Disease evaluations

OAC Rosito was evaluated for disease reactions with *Colletotrichum lindemuthianum,* causing anthracnose (Sacc. & Magnus), and Xanthomas *Xanthomonas axonopodis* pv. *phaseoli*, and *X*. *fuscans* subsp. *fuscans* causing common bacterial blight.

Anthracnose inoculation was done with 10-15 plants maintained under controlled conditions in growth chambers at the Greenhouse Processing Crop Research Centre (GPCRC), Harrow, ON. according to the method of Balardin et al. (1997) by brushing both the upper and lower surfaces of fully expanded primary leaves of 7-10 day-old seedlings with *C. lindemuthianum* (race 73) spores (10^6 spores mL^{-1}) cultured in Mathur's medium. Disease rating was done 5 d after inoculation using a visual score of 1-9, with 9 being the most susceptible and was repeated 3 d later (Corrales and Schoonhoven 1987).

Common bacterial blight disease reaction was tested in a CBB nursery at GPCRC, Harrow, ON. For this, artificial inoculation was carried out using fresh bacterial inoculum, prepared by mixing equal amounts of *Xanthomonas axonopodis* pv. *phaseoli*, (ISO18, and ISO98) and *X*. *fuscans* subsp. *fuscans* (ISO12, ISO118) with a density of 10^8 CFU/ mL. The inoculum was sprayed at 200 *psi* at driving speed of 3.22 km hr^{-1} with XR TEEJET 11002VS drop nozzles. The pressure was sufficient to produce water soaking marks on leaves. Common bacterial blight severity was rated visually on a scale of 0 to 5 based on the percentage of inoculated leaf surface with disease symptoms (Yu et al. 2000).

OAC Rosito had a susceptible CBB reaction similar to Zorro and Merlot (Table 3). It is negative for the SU91 SCAR marker (Miklas et al., 2000), which has a significant association with CBB resistance. It was susceptible to the race 73 of anthracnose.

Maintenance and Distribution of Pedigreed Seed

OAC Rosito was planted in the growth room at the University of Guelph for purification and multiplication of disease-free seed in 2016. It was planted in isolation plots for purification and multiplication of seed in a seed-borne disease-free environment in Twin Falls, Idaho in 2016 for pre-breeder and breeder seed production. Progeny-rows planted in Idaho were bulked and this seed formed the first breeder seed. University of Guelph, Guelph, ON, Canada, N1G 2W1, will maintain the breeder seed. Pedigree seed will be distributed by Hensall District Co-operative (HDC), 1 Davidson Drive, P.O. Box 219, Hensall ON N0M 1X0 Canada, Phone: 519-262-3002, Fax: 519-262-2317.

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References

Balardin, R.S, Jarosz, A.M. and Kelly, J.D. 1997. Virulence and molecular diversity in *Colletotrichum lindemuthianum* from South, Central and North America. Phytopathology **87**: 1184-1191.

Batres-Marquez, P., Jensen, H.H. and Brester, G.W. 2001. Salvadoran Consumption of Ethnic Foods in the United States Center for Agricultural and Rural Development Iowa State University, Ames, Iowa 50011-1070 *www.card.iastate.edu*.

Corrales, M. A. P., and van Schoonhoven, A. 1987. Standard system for the evaluation of bean germplasm. CIAT.

Hosfield, G.L.; Varner, G.V.; Uebersax, M.A.; Kelly, J.D. 2004. Registration of 'Merlot' small red bean. Crop Science 44: 351-352

Kelly, J.D., Varner, G.V., O'Boyle, P. and Long, B. 2009. Registration of 'Zorro' Black Bean. Journal of Plant Registrations, 3: 226

Miklas, P.N., J.R. Smith, R. Riley, K.F. Grafton, S.P. Singh, G. Jung, and D.P. Coyne. 2000. Marker-assisted breeding for pyramided resistance to common bacterial blight in common bean. Annu. Rpt. Bean Improvement Coop. 43:39–40.

Yu K., Park S.J., and Poysa V. 2000. Marker-assisted selection of common beans for resistance to common bacterial blight: efficacy and economics. Plant Breed. **119**: 411-415.

Table 1. Yield, days to maturity and seed weight of bean cultivars Zorro, Merlo, and OAC Rosito from Ontario Small Coloured Bean Registration and Performance Trials in Ontario in 2013, 2014 and 2015.

Cultivar	Yield (Kg ha-1)			Maturity			Harvestability[a]			100-Seed weigh (g)		
	2013	2014	2015	2013	2014	2015	2013	2014	2015	2013	2014	2015
Zorro	3944	2579	3249	96.3	92	99	1.4	3	2.0	21.5	18.7	21.7
Merlot	3339	2609	2575	92.4	89.5	92	2.1	3.5	2.0	21.5	29.1	35.6
OAC Rosito	3444	1945	2648	92.5	92.5	99	1.7	3.5	2.0	21.6	20.7	22.9
LSD (0.05)	236	168	404	1.5	NA	2.17	0.3	0.89	0.5			

[a]harvestability is determined at maturity using a 1 to 5 scale, from 1=upright plants with pods off the ground, 3 = partially upright plants with pods closer to the ground to 5 = plants lodged and pods on the ground. Test locations were Kippen and St. Thomas in 2013 and 2014 and Exeter and St. Thomas in 2015.

Table 2. Cooking quality of canned beans of OAC Rosito compared with commercial check cultivars grown in the Ontario Small Coloured Bean Registration and Performance Trials in 2013 and 2014.

Cultivar	Hydration Coefficient[z]		Matting (1-4)[y]		Washed Drained wt. (%)[x]		Texture Measurement[w]			
							Plateau Force (N)		Firmness (N mm^{-1})	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Zorro	2.5	2.5	2.5	1.0	57.5	59.8	875.5	704.8	46.0	34.7
Merlot	2.5	2.2	2.0	1.3	59.9	58.8	819.0	596.4	34.5	32.1
OAC Rosito	**2.3**	**1.9**	**1.5**	**1.0**	**57.6**	**57.9**	**975.5**	**738.1**	**48.0**	**36.1**
LSD	0.07	0.1	0.8	0.57	1.8	1.67	103.4	62.8	5.5	3.1

[z] Soaked seed was blanched for 3 min at 93^{o}C. Hydration coeffcient after blanching was determined as: seed weight after blanching / dry weight. [y] Scored visually; 1: no clumping and 4: moderate clumping. [x] Weight of beans after washed and drained on a screen, presented as percentage of unwashed-undrained weight. [w] Texture of canned beans was measured on Instron Texture measurement system using wire extrusion cells.

Table 3. Response of OAC Rosito to common bacterial blight (CBB) and anthracnose (Race 73) compared with commercial check cultivars.

Cultivar	CBB[y]	Anthracnose[x]
Zorro	S	S
Merlot	S	S
OAC Rosito	**S**	**S**

[y] Common bacterial blight (CBB) scores were recorded in replicated trials in an artificially inoculated common bacterial blight nursery in the field at Harrow (Yu et al. 2000).

[x]Anthracnose scores were recorded in artificially inoculated disease screening in growth chambers at GPCRC where 0 = no symptoms, 1= < 5%, 2 = 5-10%, 3 =10-25%, 4 = 25-50%, and 5 = 50-100% (Yu et al. 2000).