

White Kidney Bean 'Yeti'



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

'Yeti' is a full season maturity white kidney bean with excellent yield and good seed size

Performance Data*

Variety	Market Class	Yield ^a (lbs/ac)	Maturity ^b (DAP)	100 Seed Weight (g)	Harvestability
Yeti	White Kidney	2128	97	61	2.6
OAC Inferno	Light Red Kidney	2362	99	68	3.3
Pink Panther	Light Red Kidney	2089	88	65	2.9
Big Red	Light Red Kidney	2070	86	61	2.6
Dynasty	Dark Red Kidney	2339	94	65	2.8
Red Hawk	Dark Red Kidney	1933	89	57	2.8
Mean		2154	92	63	2.8

*2016 - 2018 OPCC Performance data, 4 location years, Days to Maturity, Yield and Seed Weight are 3 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

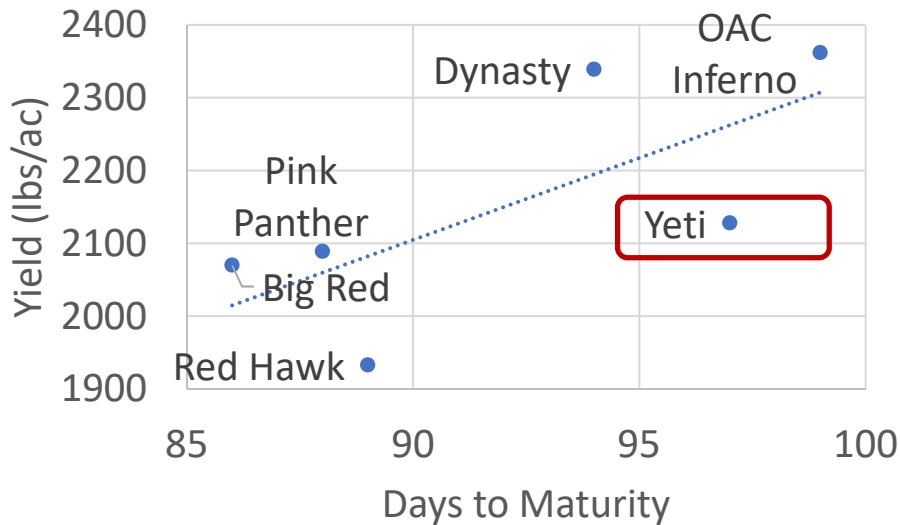
Variety	BCMV		Anthracnose ^b			Common Bacterial Blight ^c
	Race 1	Race 15	Race 17	Race 23	Race 73	
Yeti	R	R	NA	S	S	S
OAC Inferno	R	S	R	S	R	S
Pink Panther	R	R	R	S	R	S
Big Red	NA	NA	NA	NA	R	S
Dynasty	R	S	R	S	R	S
Red Hawk	R	R	R	S	R	S

^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*



*2016 - 2018 OPCC Performance data, 4 location years, Days to Maturity, Yield and Seed Weight are 3 year averages, Adapted from GoBeans.ca Infosheets.

Pedigreed seed available at:
Hensall District Co-operative (HDC)
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Yeti kidney bean

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Abstract: Yeti is a full-season white kidney bean (*Phaseolus vulgaris* L.) cultivar with tall bush plant architecture; high yield potential and good cooking quality. Yeti is adapted to and recommended for the dry bean growing areas in Southwestern Ontario.

Key words: *Phaseolus vulgaris* L., white kidney bean.

Résumé : Yeti est une variété de haricot (*Phaseolus vulgaris* L.) blanc de pleine saison. Ce cultivar se caractérise par un port arbustif de haute taille, un rendement potentiel élevé et une bonne tenue à la cuisson. Yeti est adapté aux régions du sud-ouest de l'Ontario où l'on cultive le haricot, pour lesquelles on le recommande. [Traduit par la Rédaction]

Mots-clés : *Phaseolus vulgaris* L., haricot blanc.

Introduction

Yeti is a tall, bush-type determinate kidney bean (*Phaseolus vulgaris* L.) cultivar with high yield and full maturity. Yeti was developed by the University of Guelph, Guelph, Ontario, Canada and was tested in the Ontario Large-seeded Colour Bean Registration and Performance Trials in 2010, 2011, and 2012. Yeti was registered at the Variety Registration Office, Canadian Food Inspection Agency (CFIA), Ottawa, ON, on 8 May 2013 (Registration no. 7385).

Pedigree and Breeding Method

Yeti was developed from the cross AC Calmont/PI358207 in 2002. The variety AC Calmont (Park et al. 1999), known for its high yield potential and disease resistance, particularly resistance to anthracnose races 17, 23, and 89, and bean common mosaic virus (BCMV) races 1 and 15, was developed from a cross between California Light Red Kidney (CLRK) and Montcalm. The cultivar CLRK had good cooking quality and adaptability to Ontario, whereas, Montcalm is dark red kidney bean variety used for its good canning quality, high yield and

resistance to BCMV. PI358207 is a white kidney bean line from the US-NPGS collected in Macedonia in 1970.

Cross, AC Calmont/PI358207, was made in the growth room facilities of the Department of Plant Agriculture, University of Guelph in 2002. The F₁ was advanced to the F₂ generation in the growth room and the progeny were advanced to the F₅ by a bulk method in the Elora research station in 2006. Single plants were selected from the F₅ bulk population and tested in progeny rows (F_{5,6}) in 2007. The main selection criteria for single plants were resistance to anthracnose and high yield potential. Selected rows were harvested and tested as F_{5,7} lines in preliminary yield trial sat in the Elora Research Station in 2008. In 2009, one F_{5,8} line was designated as ACUG 10-W1 and was planted in the advanced yield trials conducted at the Elora Research Station and in a farmer's field near St. Thomas, ON.

Performance

Yeti was entered into the Ontario Color Bean Registration and Performance Trials and was evaluated across Ontario in 2010, 2011, and 2012. These trials are performed under the guidelines set by the Ontario

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Table 1. Yield, days to maturity, and seed weight for Yeti white kidney bean compared with Beluga, tested in the Ontario Colored Bean Registration and Performance Trials during 2010–2012^a.

Cultivar	Yield (kg ha ⁻¹)			Days to maturity			100-Seed weight (g)		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
Beluga	3063	2520	2417	93.2	106.0	93.2	56.0	60.1	57.3
Yeti	3119	2878	2699	90.8	102.0	94.7	54.3	58.6	55.5
LSD ($P < 0.05$)	243	209	176	1.5	1.6	2.8	2.3	2.2	1.9

^aTest locations were St. Thomas, Kippen and Thorndale in 2010; Elora, St Thomas, Kippen, Monkton, and Woodstock in 2011; and Blyth, Elora, Kippen, Highbury, Woodstock, and St. Thomas in 2012.

Pulse Crop Committee (www.gobeans.ca) and conducted annually at various locations across the main bean growing areas in Ontario with four replications per location. Test locations with coefficient of variation (CV) of yield (kg ha⁻¹) lower than 18% are considered valid tests. The yield was adjusted to 18% moisture after harvest. Days to maturity, defined as number of days from planting to maturity, and 100-seed weight were determined for each plot in each location. In each year, least squares means and least significant difference ($P = 0.05$) were estimated for each genotype. The line was evaluated for cooking and canning quality parameters at the Greenhouse and Processing Crop Research Center, Agriculture and Agri-Food Canada (AAFC), Harrow in 2010 and Lethbridge Research Center, AAFC, Lethbridge in 2011.

Anthraxnose caused by [*Colletotrichum lindemuthianum* (Sacc. & Magnus)] and bean common mosaic virus (BCMV) symptoms were evaluated after inoculation of 10–15 plants grown in 1-L pots filled with ProMix at the AAFC, Harrow, ON. Anthracnose inoculation was done 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* spores (10⁶ spores mL⁻¹) cultured in Mathur's medium. Inoculated plants were placed in a mist chamber, 100% humidity at 23°C for 48 h, and then transferred to a growth cabinet at 23/18°C day/night temperature with a 14 h photoperiod. Disease rating was done 5 days after inoculation using a visual score of 1–9, with 9 being the most susceptible and was repeated 3 days later (Corrales and van Schoonhoven 1987). Inoculation for BCMV was done on 10-day-old plants or when unifoliate leaves were fully expanded. The inoculum was maintained by multiple cycles of harvesting seeds from infected plants. For inoculation, three to five infected leaves were ground using a mortar and pestle in a 0.01 molar phosphate buffer (pH = 7.0) with an addition of carborundum powder (Fisher Scientific, Pittsburgh, PA). The upper surfaces of the leaves were covered with the ground infected leaves. Once the surfaces were dry the plants were misted with water and maintained at 23/18°C day/night temperature with a 14 h photoperiod. Beginning 10 days after

Table 2. Cooking quality of canned beans of Yeti compared with Beluga grown in the Ontario White Bean Registration and Performance Trials in 2010 and 2011, averaged over three locations.

Cultivar	Washed drain weight % ^a		Texture measurement ^b			
	2010	2011	Plateau force (N)		Firmness (N/mm)	
			2010	2011	2010	2011
Beluga	62.3	57.8	279.0	167.2	12.7	10.9
Yeti	61.8	56.2	265.4	170.7	16.8	8.0
LSD ($P < 0.05$)	2.1	3.4	30.4	57.2	3.4	2.9

^aWeight of beans after washing and draining on a screen, presented as percentage of unwashed-undrained weight.

^bTexture of canned beans was measured on Instron Texture measurement system using wire extrusion cells.

inoculation, seedlings showing clear signs of mosaic or systemic necrosis were counted and removed and scored as susceptible. Beginning 20 days after inoculation, plants clearly not affected by necrosis are counted and removed and scored as resistant (Johnson et al. 1997).

Across 14 location-years in the Ontario Colored Bean Registration and Performance Trials during 2010, 2011 and 2012, Yeti white kidney bean on average yielded 2898 kg ha⁻¹, which was 9% higher than the check cultivar Beluga (Table 1). In these tests, Yeti was rated as a full-season maturity line, maturing 1.5 days earlier than check. Yeti had similar seed weight compared to check cultivar with a seed mass ranging from 54.3 to 58.6 g 100 seed⁻¹.

Washed drained weight determines how many beans are needed to fill a can. Therefore, washed drained weights of canned beans can be directly compared to each other to determine water uptake by the beans during the entire canning process (Hosfield et al. 1984). The washed drained weight, 61.8 and 56.2% in 2010 and 2011, respectively, was similar to the check. The texture of canned Yeti kidney bean was acceptable based on texture parameters. It had similar values to the check, Beluga, but had a significantly higher firmness value than check in 2010 (Table 2). Yeti is resistant to

Table 3. Response of Yeti to anthracnose and bean common mosaic virus (BCMV) compared with commercial cultivars.

Cultivar	Anthracnose ^a		BCMV ^b	
	Race 23	Race 73	Race 1	Race 15
Inferno	S	R	R	S
Dynasty	S	R	R	S
Lighthouse	R	S	R	R
Yeti	S	R	R	R

^aReactions against Anthracnose race 17, 23, and 73 reported as susceptible (S) and resistant (R) following artificial inoculation under controlled condition.

^bReactions against bean common mosaic virus race 1 and 15 reported as resistant (R) following artificial inoculation under controlled condition.

anthracnose race 73 and BCMV races 1 and 15 (Table 3). In molecular marker screening, Yeti possesses SCAR marker SW13 (Melotto et al. 1996) known to be linked to the hypersensitive response *I* gene on chromosome Pv02 and SCAR marker SAS13 associated with anthracnose resistance.

Yeti has a determinate bush-type growth habit. It has green hypocotyl and white flowers. Yeti plants have a medium green leaf colour. The pods are light tan colour when ripe, and covered with short pubescence. Pods have slight to no curvature with a short straight beak. Seeds are white with dull seed coat lustre and white hilum. Yeti is adapted to and recommended for dry bean growing areas in Southwestern Ontario.

Maintenance and Distribution of Pedigreed Seed

Yeti was planted in isolated disease-free plots for purification and breeder seed production in Idaho, USA in

2012. The University of Guelph bean breeding program will maintain the breeder seed. Pedigreed 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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