



### Niche Market Dry Bean Variety Trial

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Dry beans (*Phaseolus vulgaris*) are generally considered a large-scale bulk commodity crop yet they are also well suited to small-scale production for niche markets. Dry beans are harvested in the fall, are easily stored over the winter, and can be a good addition for direct market farmers who need additional crops at the beginning and end of the growing season. A primary criterion for variety suitability in the maritime Pacific Northwest is early maturity. Cool summer temperatures in the region result in a low number of growing degree days (1900 GDD in Vancouver) and most varieties are harvested 15 or more days later than in the mid-west. A primary objective for evaluating dry beans in Vancouver was to determine which varieties are suitable for production in the maritime Pacific Northwest.

### Materials and Methods

The field was prepared in May and dry beans were planted on May 26, 2005. The experiment had a randomized complete block design with four replications and included 54 varieties. Plots were 2 rows wide and 10 feet long, spacing between rows was 2 feet, and spacing in the row was 2 inches.

The field was certified organic and was maintained accordingly. Plots were mechanically cultivated once a week to control weeds between rows, and hand weeded to control in-row weeds as needed from July through August. Overhead irrigation was applied to the field on a weekly basis or as needed.

An organic fertilizer (12-0-0) was applied at a rate of 24 lb N/A on June 14, 2005 and a second fertilizer application (7-7-2) was made at the rate of 20 lb N/A on July 12 for a total N application of 44 lb/A. Halo Blight symptoms were observed, and Basicop was applied at a rate of 2.2 kg/ha, once each in June and July. In addition, symptomatic plants were continually rogued.

Days after planting (DAP) to 50% emergence, first flower and 50% flowering were measured. Plant stand was measured in 10 feet of row. Plant height (cm) was measured mid-season for 10 randomly selected plants in each plot, from the base of the plant (soil surface) to the top node. Plant stand was counted at the same time. Plants were harvested from the center 5 feet of both rows in each plot for a total harvest area of 10 feet per plot. Whole plants were harvested, placed in burlap bags, and dried in field ovens for approximately 16 hours at 68° C, until seed moisture was approximately 12%. Beans were threshed and cleaned by small-scale machines that we built in 2003 for this purpose. Total marketable bean yield (g) was measured. One hundred beans were randomly selected and weighed from each plot. If plot yield was less than 100 beans, the

total weight was divided by the number of beans and converted to 100-bean-weight. Length and width (cm) of 25 beans were measured and converted to length and width per bean. Ten pods were randomly selected and pod length (cm) and number of beans per pod were measured. The number of pods per plant was calculated by randomly selecting 5 plants at harvest.

## Results and Discussion

Fifty percent emergence occurred from 9 to 32 DAP and the mean was 16 DAP (Table 1). Flowering began, on average, 45 DAP while harvest began early September and continued through early October. Mean plant height was 28 cm. Plant stand varied greatly among entries with an average stand of 60 per ten row feet. Entries with poor plant stands in 2005 were BelNeb-RR-1, Black Turtle, Black Valentine, Brown Dutch, Cardinal, CELRK, H9659-37-2, Maine Yellow Eye, Molasses Face, Montcalm, Navy Bean, Othello, PI549776, Peruano, Red Kidney, Red Mexican, Soldier, USCR-14, and USCR-15. All these entries did not germinate well, and had stands below 50% following emergence. DAP to 50% emergence, DAP to first flowering, DAP to 50% flowering, DAP to harvest, plant height at harvest, and plant stand at harvest all differed significantly.

Mean yield for 10-foot row was 612 g (Table 2). The lowest yielding entry overall was Black Turtle (352 g). The highest yielding entries were Peruano (1033 g), Pinto (908 g), Red Mexican (867 g), USRM-20 (894 g), and W614737 (774 g). The average number of pods per plant was 8.5, with a minimum of 4 (Autumn Bounty, Calypso, Light Red Kidney and USCR-15) and a maximum of 28 (Black Turtle). The overall mean pod length was 9.9 cm. The entries with the longest pods were H9659-37-2, Light Red Kidney, Magpie, Peruano, USCR-14 and USCR-15, which all measured an average of at least 11.5 cm. The average number of beans per pod was 4 and ranged between 3 to 6 beans per pod. Mean weight of 100 beans was 42 g. Entries with the greatest 100-bean-weight on average were Jacob's Cattle (56.5 g, Autumn Bounty (60.1 g), USCR-15 (60.6 g), Soldier (61.4 g), and Hidatsa Shield Figure (66.1 g). Total yield, pods per plant, pod length, beans per pod, and 100 bean weight all differed significantly.

Length and width of beans were measured in order to further characterize bean size. The overall mean length of a bean was 1.3 cm and mean width was 0.8 cm (Table 3). Black Turtle, Navy Bean, Navy Pea, and UI-911 were the shortest beans (0.9 cm), while H9659-37-2, Light Red Kidney, and Red Kidney were the longest beans (1.5 cm). Black Turtle, Black Valentine, H9673-87, ICB-10-5, Magpie, Navy Pea and UI-911 were the narrowest beans (0.6 cm), and Indian Woman Yellow was the widest bean (2.2 cm).

Halo Blight (*Pseudomonas syringae*) symptoms were first observed on plant leaves in the beginning of June. Symptoms were evident on entries 95:8186C, CELRK, Great Northern, Jacob's Cattle, LeBaron, Light Red Kidney, Low's Champion, Maine Yellow Eye, Red Kidney, UI-911, USCR-14, and W614733.

## Conclusions

In this study, we found approximately 50 dry bean varieties suitable for production in the maritime Pacific Northwest. The primary criterion for suitability in this region is days to harvest. In our area 115 days after planting appears to be near the maximum length of growing season that ensures the beans will be harvested before the winter rains begin in late September.

One of the primary constraints to dry bean production for small-scale farmers is affordable and effective threshing and seed cleaning equipment. In 2003, we developed a small-scale thresher and a seed cleaner and the plans for these are posted on our web site, <http://sustainableseedsystems.wsu.edu/nicheMarket/smallScaleThreshing.html>.

Based on previous studies, we created a web page that describes dry bean varieties with an emphasis on varieties that are suitable for niche markets. We have updated this web page, <http://sustainableseedsystems.wsu.edu/nichemarket/beanvarieties.pdf>, with based on the results from this study. This web page is designed to facilitate variety selection by farmers by including a brief description of each variety based on our data and observations, and a color photograph. The color, pattern and size of dry beans play a large role in variety selection for niche markets.

**Table 1.** DAP to 50% Emergence (days), DAP to 1<sup>st</sup> Flowering (days), DAP to 50% Flowering (days), DAP to Harvest (days), Plant Height at Harvest (cm), Plant Stand at Harvest.

Variety	DAP to 50% Emergence	DAP to 1 <sup>st</sup> Flowering	DAP to 50% Flowering	DAP to Harvest	Plant Height at Harvest	Plant Stand at Harvest
<b>Dark Red Kidney</b>						
Fiero	16	45	49	111	30	73
Low's Champion	21	48	52	112	26	63
Montcalm	18	45	49	114	32	57
<b>Light Red Kidney</b>						
CELRK	18	43	45	107	30	37
H9659-37-2	18	51	53	112	27	47
Ireland Creek Annie	14	43	46	108	26	65
Light Red Kidney	17	46	48	112	34	72
Red Kidney VBSC	18	45	48	106	26	58
W614733	17	47	55	125	32	66
W614737	17	45	49	117	27	79
<b>White Kidney</b>						
BEL/NEB-RR-1	15	50	54	104	26	51
<b>Small White/Navy</b>						
Great Northern VBSC	16	50	53	104	25	68
Marrow Fat	9	38	42	123	33	62
Navy Bean	32	49	54	114	24	30
Navy Pea	16	51	54	108	23	64
<b>Small Red/Red Mexican</b>						
Cherokee Wax	15	42	46	108	30	70
LeBaron	16	43	51	104	25	61
Red Mexican	n/a	46	50	114	23	28
UI-239	15	48	52	106	25	67
USRM-20	18	51	54	107	28	71
<b>Black</b>						
Black Coco	17	42	45	110	30	65
Black Turtle	n/a	56	59	122	18	6
Black Valentine	18	45	49	111	28	57
H9673-87	15	47	55	104	24	70
ICB-10-5	16	52	55	108	23	77
UI-911	14	44	47	109	30	71
<b>Cranberry</b>						
95:8186C	17	45	49	111	32	69
Borlotti	10	37	39	121	36	68
Cardinal	17	44	47	109	32	58
USCR-14	18	44	46	111	32	50
USCR-15	18	46	49	115	34	58
<b>Pinto</b>						
Burke	117	45	49	109	27	63
Othello	15	43	47	108	31	51
Pinto VBSC	14	49	53	104	34	68
USPT-CBB-1	15	43	46	104	26	68

**Table 1 (cont'd)**

Variety	DAP to 50% Emergence	DAP to 1 <sup>st</sup> Flowering	DAP to 50% Flowering	DAP to Harvest	Plant Height at Harvest	Plant Stand at Harvest
<b><i>Yellow Eye/Partially Colored</i></b>						
Autumn Bounty	18	43	46	107	24	70
Calypso	16	41	45	109	23	64
Hidatsa Shield Figure	18	48	52	109	30	65
Jacob's Cattle	16	42	46	108	28	67
Magpie	15	45	48	111	26	68
Maine Yellow Eye	17	43	46	107	27	53
Molasses Face	n/a	51	54	115	26	17
Orca	17	53	59	110	30	65
Peruano	10	38	44	134	35	54
Soldier	20	44	48	111	29	45
<b><i>Brown or Yellow</i></b>						
Brown Dutch	19	46	49	110	n/a	54
China Yellow	15	42	46	108	n/a	66
Hutterite	17	45	48	109	26	61
Indian Woman Yellow	14	40	45	106	25	67
PI 353479	15	42	45	106	29	69
PI 549776	15	42	46	104	29	58
Swedish Brown	18	45	48	109	30	61
<b><i>Other</i></b>						
Peregrion	<b><i>15</i></b>	<b><i>49</i></b>	<b><i>53</i></b>	<b><i>109</i></b>	<b><i>28</i></b>	<b><i>70</i></b>
<b><i>Mean</i></b>	<b><i>16</i></b>	<b><i>45</i></b>	<b><i>49</i></b>	<b><i>110</i></b>	<b><i>28</i></b>	<b><i>60</i></b>
<b><i>p-value</i></b>	<b><i>0.0000</i></b>	<b><i>0.0000</i></b>	<b><i>0.0000</i></b>	<b><i>0.0000</i></b>	<b><i>0.0000</i></b>	<b><i>0.0000</i></b>

**Table 2.** Total yield (g), number of pods per plant, pod length (cm), number of beans per pod, weight of 100 beans (g).

Variety	Total Yield	Pods per Plant	Pod Length	Beans per Pod	100 Bean Weight
<b>Dark Red Kidney</b>					
Fiero	498.8	5	10.2	3.7	47.5
Low's Champion	501.7	5	9.4	4.3	55.2
Montcalm	599.5	6	10.4	4.4	51.1
<b>Light Red Kidney</b>					
CELRK	454.9	8	10.4	4.3	54.5
H9659-37-2	699.5	8	11.7	4.3	48.8
Ireland Creek Annie	504.3	6	9.6	4.1	43.0
Light Red Kidney	566.5	4	11.5	4.6	56.4
Red Kidney VBSC	560.4	6	10.9	4.2	50.4
W614733	685.3	9	10.1	4.4	49.3
W614737	774.0	6	9.6	4.4	36.1
<b>White Kidney</b>					
BEL/NEB-RR-1	677.4	10	10.5	5.6	36.1
<b>Small White/Navy</b>					
Great Northern VBSC	743.2	7	11.3	4.9	34.3
Marrow Fat	622.2	9	10.5	4.7	36.4
Navy Bean	679.8	25	8.5	4.6	20.4
Navy Pea	646.2	15	8.6	5.6	18.8
<b>Small Red/Red Mexican</b>					
Cherokee Wax	735.5	9	8.7	4.8	33.2
LeBaron	597.7	10	9.1	4.2	39.4
Red Mexican	867.4	16	9.0	4.7	36.8
UI-239	719.6	9	9.4	4.2	33.7
USRM-20	894.5	11	9.8	4.1	44.7
<b>Black</b>					
Black Coco	498.1	5	10.0	4.5	53.2
Black Turtle	351.6	28	8.8	6.1	20.4
Black Valentine	596.4	9	14.4	5.4	30.7
H9673-87	745.8	11	8.5	5.6	22.7
ICB-10-5	640.4	10	8.6	4.6	24.5
UI-911	681.7	11	8.4	5.8	20.8
<b>Cranberry</b>					
95:8186C	560.2	5	9.7	4.2	52.5
Borlotti	659.8	6	11.0	4.7	46.2
Cardinal	522.3	5	10.2	4.5	53.5
USCR-14	507.9	5	11.5	4.5	51.9
USCR-15	482.0	4	11.7	4.8	60.6
<b>Pinto</b>					
Burke	611.4	8	9.4	4.5	41.0
Othello	689.4	9	9.6	4.6	40.0
Pinto VBSC	608.3	12	10.4	5.2	38.5
USPT-CBB-1	673.3	8	9.2	4.4	39.9

**Table 2 (cont'd)**

Variety	Total Yield	Pods per Plant	Pod Length	Beans per Pod	100 Bean Weight
<b><i>Yellow Eye/Partially Colored</i></b>					
Autumn Bounty	502.0	4	9.7	4.5	60.1
Calypso	412.6	4	9.2	3.6	51.4
Hidatsa Shield Figure	615.8	8	8.0	3.3	66.1
Jacob's Cattle	481.1	5	11.3	4.9	56.5
Magpie	557.4	8	12.9	4.5	35.1
Maine Yellow Eye	370.1	6	8.3	3.5	44.1
Molasses Face	408.5	17	8.5	3.8	49.3
Orca	629.2	9	9.0	4.7	35.5
Peruano	1033.0	8	11.8	4.9	46.9
Soldier	599.4	8	10.3	3.8	61.4
<b><i>Brown or Yellow</i></b>					
Brown Dutch	575.5	8	9.1	3.3	43.2
China Yellow	410.6	5	9.1	4.1	34.1
Hutterite	709.8	7	9.2	4.5	41.3
Indian Woman Yellow	490.3	7	9.2	4.0	27.9
PI 353479	519.1	6	9.6	3.6	46.1
PI 549776	439.1	6	10.9	4.1	44.9
Swedish Brown	656.4	8	8.7	3.6	45.6
<b><i>Other</i></b>					
Peregion	743.6	10	9.2	4.6	27.8
<b><i>Mean</i></b>	<b><i>611.7</i></b>	<b><i>8.5</i></b>	<b><i>9.9</i></b>	<b><i>4.5</i></b>	<b><i>42.3</i></b>
<b><i>p-value</i></b>	<b><i>0.0000</i></b>	<b><i>0.0000</i></b>	<b><i>0.0000</i></b>	<b><i>0.0000</i></b>	<b><i>0.0000</i></b>

**Table 3.** Length of 25 beans (cm) and width of 25 beans (cm).

Variety	Bean Length	Bean Width
<b>Dark Red Kidney</b>		
Fiero	1.4	0.9
Low's Champion	1.2	0.8
Montcalm	1.3	0.7
<b>Light Red Kidney</b>		
CELRK	1.4	0.8
H9659-37-2	1.5	0.7
Ireland Creek Annie	1.3	0.8
Light Red Kidney	1.5	0.8
Red Kidney VBSC	1.5	0.8
W614733	1.4	0.8
W614737	1.2	0.7
<b>White Kidney</b>		
BEL/NEB-RR-1	1.2	0.8
<b>Small White/Navy</b>		
Great Northern VBSC	1.2	0.7
Marrow Fat	1.3	0.8
Navy Bean	0.9	0.7
Navy Pea	0.9	0.6
<b>Small Red/Red Mexican</b>		
Cherokee Wax	1.1	0.8
LeBaron	1.2	0.9
Red Mexican	1.2	0.8
UI-239	1.3	0.8
USRM-20	1.3	0.8
<b>Black</b>		
Black Coco	1.2	0.8
Black Turtle	0.9	0.6
Black Valentine	1.4	0.6
H9673-87	1.0	0.6
ICB-10-5	1.0	0.6
UI-911	0.9	0.6
<b>Cranberry</b>		
95:8186C	1.3	0.9
Borlotti	1.2	0.8
Cardinal	1.2	0.8
USCR-14	1.4	0.8
USCR-15	1.4	0.8
<b>Pinto</b>		
Burke	1.3	0.9
Othello	1.3	0.8
Pinto VBSC	1.2	0.8
USPT-CBB-1	1.2	0.7

Variety	Bean Length	Bean Width
<b>Yellow Eye/Partially Colored</b>		
Autumn Bounty	1.3	0.8
Calypso	1.2	0.8
Hidatsa Shield Figure	1.3	0.8
Jacob's Cattle	1.3	0.7
Magpie	1.4	0.6
Maine Yellow Eye	1.3	0.8
Molasses Face	1.2	0.8
Orca	1.2	0.7
Peruano	1.3	0.7
Soldier	1.5	0.8
<b>Brown or Yellow</b>		
Brown Dutch	1.3	0.8
China Yellow	1.1	0.8
Hutterite	1.1	0.7
Indian Woman Yellow	1.2	2.2
PI 353479	1.4	0.7
PI 549776	1.4	0.8
Swedish Brown	1.2	0.8
<b>Other</b>		
Peregion	1.2	0.7
<b>Mean</b>	<b>1.3</b>	<b>0.8</b>
<b>p-value</b>	<b>0.0548</b>	0.0924