

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 Pacific Northwest.

Materials and Methods

The field was prepared in May and dry beans were planted on May 20, 2004. The experiment had a randomized complete block design with four replications and included 65 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 at the rate of one inch per week or according to precipitation. An organic fertilizer (9-3-7) was applied at a rate of 36 lb N/A on August 4, 2004. Halo Blight symptoms were observed starting in July, however, the organic fungicide that we used in 2003 was no longer acceptable for organic production and by the time we located a new, acceptable product, bean plants were drying down and the labeled period to spray had passed. Therefore, we did not apply a fungicide in 2004.

Days after planting (DAP) to 50% emergence and first flower were measured. Plant height (cm) was measured at first flower for 10 randomly selected plants in each plot, from the base of the plant (soil surface) to the top node. Plant stand was measured at harvest in 10 feet of row. 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 and length and width (cm) of 25 beans were measured. The number of pods per plant was calculated by randomly selecting 5 plants at harvest. Five pods were randomly selected and pod length (cm) and number of beans per pod were measured.

Results and Discussion

Fifty percent emergence occurred from 6 to 20 DAP with a mean of 13.6 DAP (Table 1), and differed significantly among entries. Eleven entries did not attain 50% emergence: Great Northern, USCR-14, W614717, W614718, W614719, W614722, W614724, W614727, W614729, W614731, and W614733. Flowering began, on average, 47 DAP while harvest began late August and ended late September; specific harvest dates are unavailable. Mean plant height at first flower was 46.8 cm and differed significantly among entries. Plant stand at harvest varied greatly among entries with an average stand of 39. All entries with less than 50% emergence also had poor plant stand at harvest.

Mean yield for the 10-ft row was 385 g, and the range was 6 to 691 g (Table 2). The lowest yielding entry was Great Northern (5.8 g), while the highest yielding entries were USPT-73, CELRK, H9673-87, Othello, and Burke which all averaged over 600 g per 10 feet row. Mean weight of 100 beans was 40 g and differed significantly among entries. Entries with the greatest 100-bean-weight on average were USCR-15 (67g), CELRK (63 g), Mansel Magic (61 g). Entries with the smallest average 100-bean weight included Great Northern (5.8 g), W6 19724 (12.5 g), W6 14718 (17.0 g), and W6 14731 (17.8 g).

Bean size, pod length and number of pods per plant were measured in order to further characterize bean size. The mean length of 25 beans was 29 cm and mean width was 18 cm (Table 2). Mean pod length was 10 cm. The entries with the longest pods were USCR-15, W614725, USWA-33, and Montcalm which all measured between 12.5 and 13.2 cm. All entries on average contained 5 beans per pod and ranged between 3 to 6 beans per pod. The mean number of pods per plant was 11. Entries W614727 and W614729 both averaged over 20 pods per plant, while W614719, W614721, W614725, UI-911 and Navy Pea all averaged over 15 pods per plant. Great Northern and W614718 had the lowest number of pods per plant, with 1.2 and 3.8, respectively.

Halo Blight (*Pseudomonas syringae*) symptoms were first observed on plant leaves in the beginning of July. Symptoms were evident on entries 95:8186C, CO406960, Maine Yellow Eye, PI 549794, Taylor's, Blush, Volcano, and W614721.

Based on our study results, we have developed a web page, <http://sustainableseedsystems.wsu.edu/nichemarket/beanvarieties.pdf>, which describes dry bean varieties with an emphasis on varieties that are suitable for niche markets. 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. Days after planting (DAP) to emergence and first flower, plant height (cm) at first flower, and plant stand at harvest (per 10 row feet) at WSU Vancouver REU in 2004.

Type Variety	DAP		Pl. Ht. (cm)	Pl. Stand
	50% Emerg.	1 st Flower	1 st Flower	Harvest
Dark Red Kidney				
Montcalm	15	45	44.8	34
Light Red Kidney				
CELRK	14	43	42.5	51
H9659-37-2	13	53	52.5	52
Red Kidney	12	43	42.5	74
USWA-33	14	46	45.5	46
USWA-39	14	45	45.0	57
W6 14718	0	29	29.0	12
W6 14719	0	57	57.3	14
W6 14722	0	26	26.0	17
W6 14724	0	12	11.8	2
W6 14725	17	48	48.0	24
W6 14727	0	54	54.3	14
W6 14733	0	55	55.0	5
W6 14737	17	47	47.0	33
White Kidney				
BEL/NEB-RR-1	13	54	54.3	22
Small White/Navy				
Great Northern	0	15	14.5	0.3
Navy Pea	17	55	54.8	38
Small Red/Red Mexican				
LeBaron	13	48	48.0	54
Red Mexican	13	46	45.5	56
UI-239	12	51	50.5	64
USRM-20	11	54	53.8	25
W6 14720	12	51	50.8	37
W6 14723	16	51	51.3	29
W6 14726	12	50	50.0	48
W6 14728	15	51	50.5	33
W6 14731	0	52	52.3	7
W6 14736	14	49	49.3	37
Black				
H9673-87	12	54	53.8	69
ICB-10-5	13	55	55.0	53
UI-911	14	47	46.8	45
W6 14721	17	46	46.3	29

Table 1 (cont.)

Type Variety	DAP		Pl. Ht. (cm) 1 st Flower	Pl. Stand Harvest
	50% Emerg.	1 st Flower		
Cranberry				
95:8186C	14	46	46.3	47
Cardinal	13	43	42.8	51
CO 406960	14	45	44.5	47
Taylor's	13	45	45.3	53
USCR-14	0	45	45.0	18
USCR-15	13	46	46.3	47
USPT-73	13	47	47.3	65
Volcano	20	44	43.8	21
W6 14729	0	55	55.0	7
Pinto				
Burke	12	47	46.8	68
Othello	17	46	46.0	45
Pinto	13	47	46.8	62
USPT-CBB-1	15	47	46.8	35
Yellow Eye/Partially Colored				
Calypso	16	43	42.8	68
Magpie	12	44	44.3	64
Maine Yellow Eye	6	44	43.8	17
Molasses Face	14	51	51.0	51
Orca	15	54	54.0	41
Red Soldier	13	43	43.0	45
Soldier	14	46	46.0	43
Brown or Yellow				
Brown Dutch	12	42	42.3	67
PI 353479	13	46	45.8	41
PI 549776	12	45	45.3	58
Other				
Amish Knuttle	9	58	58.0	13
CO 32948	13	47	47.3	54
CO 32977	13	46	46.0	40
G18689	12	54	54.3	53
Mansell Magic	13	43	42.5	57
Peregrin	12	52	52.0	49
PI 549794	14	56	56.0	31
Royal Burgandy	16	43	42.5	32
W6 14717	0	57	56.5	11
W6 14732	16	48	47.5	27
W6 14734	13	52	51.5	43
Mean	13.6	47	46.8	39
<i>p value</i>	<i>0.0000</i>	<i>0.0000</i>	<i>0.0000</i>	<i>0.0000</i>

Table 2. Total bean yield (g), weight of 100 beans (g), length (cm) and width (cm) of 25 beans, number of beans per pod, number of pods per plant, and pod length (cm) at WSU Vancouver REU in 2004.

Type Variety	T Bean	Wt 100	25 Bean (cm)		Number	No. Pods	Pod
	Wt (g)	Beans (g)	Length	Width	Beans/Pod	per Plant	Lth (cm)
Dark Red Kidney							
Montcalm	396.0	57.8	40.0	20.3	4.2	9.6	12.5
Light Red Kidney							
CELRK	652.5	63.3	42.5	19.8	3.8	10.5	11.2
H9659-37-2	452.5	45.0	37.8	19.0	4.3	9.9	12.2
Red Kidney	477.5	52.5	40.0	19.5	4.2	6.0	11.9
USWA-33	507.5	60.5	39.8	20.3	4.1	7.1	12.8
USWA-39	470.8	53.5	39.0	19.5	4.6	13.9	12.2
W6 14718	165.5	17.0	15.8	9.5	4.5	3.8	7.4
W6 14719	284.5	58.0	33.0	20.3	4.3	16.9	9.6
W6 14722	356.0	19.8	16.5	9.8	4.1	13.6	5.4
W6 14724	103.0	12.5	9.0	4.5	5.5	8.5	3.3
W6 14725	507.3	54.0	37.8	20.5	5.1	18.9	13.2
W6 14727	489.0	45.5	33.0	18.3	4.6	23.9	11.6
W6 14733	148.0	55.3	34.3	18.0	4.2	13.1	11.4
W6 14737	512.0	49.0	33.5	18.3	4.3	12.4	9.1
White Kidney							
BEL/NEB-RR-1	465.0	40.5	30.3	17.5	5.3	14.2	9.7
Small White/Navy							
Great Northern	5.8	5.8	6.5	4.0	6.1	1.2	0.0
Navy Pea	402.5	18.8	21.3	14.0	5.4	18.6	8.5
Small Red/Red Mexican							
LeBaron	459.8	41.0	29.3	19.5	4.4	10.0	9.3
Red Mexican	428.8	32.0	27.5	18.3	4.6	10.8	8.6
UI-239	519.5	31.0	27.5	18.3	4.8	9.7	8.5
USRM-20	263.5	35.5	33.0	19.8	4.3	13.1	9.8
W6 14720	414.3	29.3	26.0	16.5	5.5	13.1	9.2
W6 14723	284.5	21.8	19.0	12.5	6.2	10.8	10.0
W6 14726	347.8	31.3	27.0	17.3	5.5	9.7	9.4
W6 14728	310.0	31.5	26.8	17.5	5.7	13.4	9.8
W6 14731	230.8	17.8	13.3	8.5	5.6	8.8	10.3
W6 14736	354.8	29.8	26.0	17.0	5.8	12.6	9.8
Black							
H9673-87	639.0	21.8	23.0	16.0	5.9	13.5	9.3
ICB-10-5	563.8	26.8	27.0	16.0	5.7	13.1	10.1
UI-911	488.0	22.8	24.5	15.8	6.2	18.7	9.0
W6 14721	486.8	38.5	33.3	17.0	5.3	19.5	11.7

Table 2 (cont.)

Type	T Bean	Wt 100	25 Bean (cm)		Number	No. Pods	Pod
Variety	Wt (g)	Beans (g)	Length	Width	Beans/Pod	per Plant	Lth (cm)
Cranberry							
95:8186C	522.0	56.8	33.8	21.0	4.9	7.1	11.5
Cardinal	510.0	60.5	33.5	22.0	4.8	7.4	11.2
CO 406960	194.3	42.0	29.8	20.3	4.3	5.1	9.4
Taylor's	344.5	43.0	31.3	19.8	4.9	6.9	11.0
USCR-14	203.3	38.0	24.8	15.0	5.0	8.5	12.0
USCR-15	408.8	66.8	37.0	23.5	4.7	6.3	12.6
USPT-73	690.8	42.5	33.0	20.0	5.6	7.0	12.0
Volcano	162.5	59.8	31.8	23.8	4.6	7.3	11.1
W6 14729	160.0	51.3	29.5	20.0	4.1	22.7	8.7
Pinto							
Burke	603.5	38.0	30.5	19.5	5.0	9.1	10.0
Othello	616.3	40.8	29.5	20.0	4.9	11.2	10.0
Pinto	538.3	35.0	28.3	18.5	5.2	7.8	9.8
USPT-CBB-1	420.5	37.0	30.0	19.3	4.5	10.9	7.1
Yellow Eye/Partially Colored							
Calypso	380.0	55.0	30.5	20.5	3.4	5.6	9.9
Magpie	498.8	35.8	35.8	14.8	4.7	8.5	11.7
Maine Yellow Eye	175.5	34.8	21.3	14.8	3.6	7.7	6.8
Molasses Face	436.0	45.8	39.5	20.0	4.3	10.4	8.9
Orca	449.5	34.5	29.5	18.0	4.6	10.7	9.4
Red Soldier	353.8	50.3	38.0	21.0	3.8	8.6	11.5
Soldier	419.8	52.3	37.0	18.5	4.3	6.2	12.2
Brown or Yellow							
Brown Dutch	479.5	43.3	30.8	21.0	4.4	9.5	9.7
PI 353479	328.3	36.5	23.8	14.0	3.6	5.4	10.1
PI 549776	483.3	54.0	34.3	20.0	3.7	6.5	10.5
Other							
Amish Knuttle	66.0	20.0	24.0	19.0	6.0	11.9	7.1
CO 32948	495.3	43.0	31.5	19.5	4.7	7.9	9.7
CO 32977	290.8	31.3	23.8	14.8	4.7	5.7	7.4
G18689	595.3	26.3	26.3	16.3	6.1	14.5	9.6
Mansell Magic	473.0	61.3	34.3	22.0	4.0	8.0	11.3
Peregrin	398.8	27.3	27.3	16.5	5.8	11.5	10.1
PI 549794	91.3	20.3	26.3	16.0	5.0	9.0	8.8
Royal Burgandy	230.8	40.3	33.8	21.5	4.8	10.8	10.7
W6 14717	131.5	23.0	23.0	13.3	5.9	12.5	11.2
W6 14732	369.0	53.5	34.5	19.8	4.5	10.0	11.7
W6 14734	286.0	51.5	30.0	20.0	4.6	7.6	10.9
Mean	384.5	39.5	29.4	17.6	4.8	10.5	9.9
<i>p value</i>	<i>0.0000</i>	<i>0.0000</i>	<i>0.0000</i>	<i>0.0000</i>	<i>0.0000</i>	<i>0.0000</i>	<i>0.0000</i>