Report to the Oregon Processed Vegetable Commission
1988

1. Title: Green bean breeding and evaluation

2. Project Leaders: J. R. Baggett, Horticulture
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3. Project Status: Continuing, indefinite

4. Project Funding for Reporting Period:

Breeding: $37,000
Processing Evaluation: $8,000

Funds allotted to breeding were used for research farm assessments, supplies and labor for planting, plot maintenance, harvest, crosses, seed production and cleaning. Funds allotted to evaluation were used for processing labor and packaging, analytical work, conducting panel evaluations, and analysis of results.

5. Objectives: Breed bush green beans for the western Oregon processing industry with:

a) Improved potential for high yields at favorable sieve sizes and dependability
b) Improved straightness, texture, and other quality factors
c) Develop easy picking and small pod strains of Blue Lake type
d) Resistance to white mold and root rot

6. Report of Progress:

A. Major activities of the bean breeding program in 1988 were:

1) Advanced breeding lines were increased in the field and in some cases included in the replicated yield trials. These lines included some newer high yielding selections such as 5402 and 5211, which came from crosses of OSU 5078 and other OSU lines. Pod set problems were not apparent early in the 1988 season when these lines matured. Replicated hand harvest yield trials included 20 lines in trials planted June 5 and June 20, and 10 lines in trials planted May 19, June 12, June 27, and July 5. Bad conditions in the form of rain and crusted soil in the earliest two, and severe pod set problems in the remainder of the trials made this a poor season to obtain good yield information. The June 5 trial was picked to obtain processing samples, but not for yield records because of a very poor and uneven stand.

Trial results are given in Tables 1-3. Processing data obtained from five of the six trials planted will be presented in a supplementary report after evaluations by Oregon State University and industry personnel are completed.

Seek Sec. 18 on Parasit - application - Amo Cyanamid - Has submitted info to EPA
Must justify emergency + no alternative

Comments on the most advanced OSU lines included in the trials follow. Most of the lines in the trials, as well as Oregon 91G and other commercial varieties, were affected badly with the split set problem. Any line which was affected more severely than Oregon 91G appears to be a poor prospect for continued increase and trial, but final decisions have not been made.

OSU 5024 sublines still appear to have excellent color and smoothness but pods get large and stand problems persist. Pod set problems were about average. This line likely will be discontinued.

OSU 5073 was erratic in pod set, but was generally no worse than Oregon 91G. Color is bright but slightly lighter than most lines and pod smoothness is variable. Yields are high.

OSU 5090 continues to look good for pod type with an average yield and pod set response. Excellent processed pod scores should justify further evaluation and increase of this line. May be less susceptible to Fusarium root rot than Oregon 91G.

OSU 5097 was relatively early in 1988, possibly because it was not delayed by pod set problems as much as other lines. Although the pod color is superior, the pods get slab-sided and they are sometimes short.

OSU 5163 should be harvested at small sieve sizes to avoid seedy pods in some conditions. Offsetting this is a very good yielding ability, good color, and good pod straightness. Observations in 1988 indicated 5163 was among the best in production in the split set situation that prevailed. May be less susceptible to Fusarium root rot than Oregon 91G.

OSU 5256 looked very good in 1988 except that it was sometimes badly affected by split set, considerably worse than Oregon 91G. Thus, it may be too risky in commercial production.

2) Evaluation and selection was continued in green bean families derived from crosses between the better OSU advanced lines. Such crosses include OSU 5061 x 91G, 5061 x 5024, 5061 x 5073, 5061 x 5097, and 5061 x 5070. A few lines from OSU lines x Slenderette were also evaluated. Selections evaluated were in the F_5 generation; in 1988 the best were saved as massed lines but single plant selections were also taken in a few most promising lines such as in 5061 x 91G. All selection work in 1988 was strongly affected by the general split set problem which occurred during most of the season. Many lines were discarded because of poor pod set and it was considered that the split set problem provided a favorable selection pressure.

3) F_3 selections from the F_2 generation of crosses of Oregon 91G, 5061, 5022, and 5056 with small sieve varieties Dandy, Cometa, and Smilo (whole pack, European type) and easy picking types were grown in the greenhouse during the winter. Greenhouse selection (F_4) and the original mother selections (F_3) were evaluated in the field in 1988 and new single plant selections were made in many families of most

crosses. In the small pod crosses, color is often the limiting factor encountered. No strong limiting factors or linkages were found in the easy picking crosses but there is a strong tendency for lines recognized as easy picking to resemble the 'Easy Pick' or 'Easy Harvest' parent in leaf, plant, and pod appearance.

4) Additional crosses were made between OSU lines (Oregon 91G and others) and an additional small pod variety 'Faria', and the variety 'Hystyle'. F_1 plants of these crosses were grown in the field for F_2 seed production.

5) Root rot and white mold trials were conducted (Tables 4 and 5) and included the OSU lines which were in the replicated yield trials. Also included were assorted resistant and susceptible control varieties. F_3 families from crosses of Oregon 91G x interspecific hybrids provided by Dr. Mok were tested in the white mold trial. These lines were originally selected in the root rot plots in 1987. When adequate seed is available, surviving lines will be tested in both root rot and white mold tests.

6) Observation of basal, semi-sterile flat pod mutants continued. Field observations suggest that at least some of these basal flat pods are not genetically transmitted. Data on 1987 selections have not been tabulated.

7) Forty-three sublines of Oregon 91G, originally selected as single plants in 1986 and evaluated in 1987, were reexamined for flat pod mutants and general trueness to type. Several lines appeared to possibly be not true Oregon 91G as indicated by the appearance of green and dried pods, but in these subjective observations influenced by environmental differences in the plots we could not be sure. Single flat podded plants were found in three lines and suspect offtypes (oval pods?) were found in several more. Fourteen of these lines were saved separately and 15 more were bulked together as a potential stock seedlot.

7. Summary:

Six replicated trials of OSU advanced bean breeding lines were conducted. A total of 20 lines were tested, including four commercial varieties. Bad germination conditions in the spring and severe split set problems in the mid-season and later trials hindered evaluation of breeding lines, but provided selection pressure against susceptibility to such problems.

Breeding in 1988 included continuation of selection in advanced lines from OSU line intercrosses and crosses between OSU lines and Slenderette, Easy Pick, Easy Harvest, and small-sieve (European type) varieties Dandy, Cometa, and Smilo. New crosses were made and the F_1 generation grown of OSU lines x Hystyle and small sieve type Faria. Root rot and white mold tests were made of regular OSU lines and lines bred for resistance to these diseases, including those derived from lines obtained from Dr. Mok's interspecific hybrid. Work on the nature of basal, semi-sterile flat pods in beans and screening of Oregon 91G selections continued.

8. Signatures:

Submitted by:

Redacted for Privacy

Project Leader _____ Date _____

Approved by:

Redacted for Privacy

Department Head _____ Date _____

Table 1. Yields of selected OSU bean lines on four planting d[illegible] Corvallis, Oregon, 1988[1]

	Line	Av. Stand	Harvest 1 Days	Harvest 1 %	Harvest 1 Tons	Harvest 1 Adj.	Harvest 2 Days	Harvest 2 %	Harvest 2 Tons	Harvest 2 Adj.	Harvest 3 Days	Harvest 3 %	Harvest 3 Tons	Harvest 3 Adj.	Harvest 4 Days	Harvest 4 %	Harvest 4 Tons	Harvest 4 Adj.	Harvest 5 Days	Harvest 5 %	Harvest 5 Tons	Harvest 5 Adj.	Avg.[2] Adj. T/A	LSD[3] Adj. T/A
May 19 Planting	91G	140	67	80	4.9	6.4	68	65	4.9	5.9	69	51	5.9	5.9*	70	56	5.4	5.7	71	43	5.1	4.8	6.1	1.2
	5024-1-9	138	67	82	4.5	6.0	69	56	5.8	6.9	71	48	6.6	6.5*	74	44	5.1	6.3					6.5	
	5073	140	67	64	5.8	6.6	69	46	5.9	5.6*	71	43	5.7	5.3									5.8	
	5090	140	67	83	4.1	5.4	69	52	6.3	6.4*	71	40	6.6	5.9	74	34	4.9	4.1					5.9	
	5097	140	67	80	4.4	5.7	69	57	6.4	6.9*	71	37	6.7	5.9	74	31	6.1	4.9					6.2	
	5163	140	67	84	5.3	6.7	68	64	5.8	6.2	69	59	6.2	6.5*	70	62	6.2	6.6	71	66	6.0	6.6	6.5	
	5256	140	67	91	4.2	5.5	68	88	4.4	5.7	69	74	4.9	5.7*	70	77	4.6	5.6	71	75	4.5	5.4	5.6	
	5257	140	68	87	4.6	5.9	70	71	5.3	6.1	71	67	5.4	6.0*									6.0	
	Hystyle	140	67	80	4.7	5.7	69	42	6.0	5.3*	71	31	5.8	4.5									5.2	
	EZ Pick	140	68	91	3.5	4.2	70	82	3.7	4.2	71	78	4.1	4.5*									4.3	
June 12 Planting	91G	150	60	50	5.1	5.1*	61	37	4.9	4.3	62	32	5.5	4.5	64	23	4.8	3.5					4.6	1.8
	5024-1-9	148	60	55	5.8	6.1*	62	35	6.9	5.9	64	25	8.7	6.5									6.2	
	5073	149	60	41	6.6	6.0*	62	28	7.4	5.8	64	15	9.3	6.0									5.9	
	5090	149	61	55	3.5	3.7*	64	34	4.4	3.7	66	26	5.6	4.3									3.9	
	5097	150	60	49	4.5	4.4*	62	43	5.4	5.0	64	33	7.2	4.8									4.7	
	5163	150	60	50	6.6	6.4	61	52	6.6	6.4*	62	44	7.5	6.8	64	36	7.0	5.8					6.5	
	5256	149	61	63	3.9	4.2*	64	44	5.3	4.8	66	32	4.9	3.9									4.3	
	5257	150	61	58	2.7	2.8*	64	46	1.4	1.3	66	34	2.2	1.8									2.0	
	Hystyle	149	60	73	4.9	5.7	61	51	4.9	4.7*	64	23	7.2	5.1									5.2	
	EZ Pick	150	61	72	3.4	3.6	64	72	5.1	5.4*	66	57	7.5	7.0									5.3	
June 27 Planting	91G	146	63	73	6.7	8.3	65	60	8.2	9.1	67	47	9.2	8.9*									8.8	NS
	5024-1-9	146	61	60	6.7	7.4	63	60	6.7	7.4*	65	40	10.0	9.0	67	39	9.6	8.5					7.9	
	5073	148	64	76	7.1	8.9	66	59	8.8	9.6	68	50	8.5	8.5*									9.0	
	5090	146	61	59	5.9	6.4	63	51	7.0	7.0*	65	38	9.9	8.7	67	31	10.2	8.2					7.4	
	5097	150	60	61	7.5	8.4	63	41	8.9	8.1	65	45	10.2	9.7*	67	30	9.7	7.8					8.7	
	5163	150	61	63	6.4	6.8	63	56	8.4	8.5*	65	51	9.9	9.5	67	49	9.4	8.9					8.3	
	5256	150	64	86	6.0	7.7	66	80	6.9	8.5	68	71	7.8	9.0*									8.4	
	5257	150	63	79	6.3	7.7	65	72	7.0	8.9	67	72	8.6	9.9*	70	39	10.2	8.7					8.8	
	Hystyle	148	64	80	6.3	7.7	66	62	7.4	7.8	68	50	7.2	6.9*									7.5	
	EZ Pick	150	63	86	6.2	7.1	65	81	6.7	7.5	67	63	7.3	7.2*									7.3	
July 5 Planting	91G	150	65	57	9.9	10.6*	68	61	9.8	10.8													10.7	1.8
	5024-1-9	148	65	47	8.1	7.9*	68	47	9.1	8.8													8.4	
	5073	148	65	51	9.4	9.4*	68	49	9.4	9.3													9.4	
	5090	150	65	53	9.2	9.5*	68	42	9.8	9.0													9.2	
	5097	150	62	65	7.1	8.2	65	48	7.9	7.7*	68	36	10.3	8.9									8.0	
	5163	150	62	70	5.3	6.0	65	58	8.8	9.1	68	57	9.4	9.6*									7.6	
	5256	150	65	61	8.2	8.7	68	58	8.9	9.2*													9.0	
	5257	150	62	89	5.8	7.6	65	71	7.6	8.8*													8.2	
	Hystyle	150	62	78	5.4	7.2	65	55	6.7	6.7*	68	47	8.2	7.6									7.0	
	EZ Pick	150	62	85	6.0	6.9	65	70	6.5	6.8	68	62	7.3	7.1*									6.8	

[1]Means of 4 replications; subplots of 5' were harvested from double 20' plots on each harvest date; rows 36" apart; days = days from planting; % = percent 1-4 sieve grades; tons = tons/acre; adj. = tons/acre adjusted to 50% 1-4 sieve, except 5163, 5256, 5257, and Hystyle, which were 55% 1-4 sieve; and EZ Pick, which was adjusted to 65%. Split set problems affected the June 12, June 27, and July 5 plantings, especially the June 12 planting which showed little recovery by late set of pods.

[2]Average adjusted yield based on the first 3 harvests in the May 19, June 12, and June 27 plantings and the first 2 harvests in the July 5 planting.

[3]Analysis of variance calculated using the harvest closest to 50% 1-4 sieve (55% for 5163, 5256, 5257, and Hystyle; 65% for EZ Pick), marked *. Adjusted yields were non-significant at 5% for the June 27 planting.

Table 2. Green bean yields, June 20 planting, Corvallis, Oregon 1988[1].

Line	Harvest 1				Harvest 2				Harvest 3			
	Days	%	Tons	Adj.	Days	%	Tons	Adj.	Days	%	Tons	Adj.
91G	56	85	3.7	4.9	58	72	5.1	6.2	60	58*	6.3	6.8
5024-1-9	56	59	5.3	5.8	59	46*	6.9	6.6				
5073	59	71*	6.3	7.6								
5090	58	71*	5.4	6.5								
5097	56	73	5.5	6.7	58	52*	7.3	7.4				
5163	58	78	6.2	8.2	60	58*	6.3	6.4				
5256	59	84*	3.4	4.5								
5257	59	78*	5.6	6.7								
5276	59	81*	4.7	6.2								
5386	56	61	5.3	5.9	58	56*	6.1	6.5				
5387	56	62	4.5	5.0	59	40*	8.8	7.9				
5394	58	77*	5.1	6.5								
5402	59	79*	5.7	7.3								
5404	58	72*	7.6	9.3								
5409	58	67*	7.3	8.5								
5411	56	59*	6.2	6.8	59	38	8.7	7.6				
Hystyle	56	65*	4.7	5.2	58	39	7.4	6.3				
EZ Pick	56	86	4.5	5.3	58	74*	5.8	6.2				
RO 168	56	83	5.8		58	67	6.8					
Roma 2	56	90	4.4		59	78	4.9					

[1]Mean of 4 replications; subplots of 5' were harvested from 20' plots on each harvest date; rows 36" apart; days = days from planting; % = percent 1-4 sieve grades; tons = tons/acre; adj. = tons/acre adjusted to 50% 1-4 sieve, except 5163, 5256, 5257, and Hystyle, which were adjusted to 55% 1-4 sieve and Easy Pick, which was adjusted to 65% 1-4 sieve. Analysis of variance calculated using the harvest closest to 50% 1-4 sieve for each line (55% for 5163, 5256, 5257, and Hystyle; 65% for Easy Pick), marked with *. LSD at 5% significance = 1.8 tons/acre.

Table 3. Summary of average yields of selected Oregon State University bean lines, 1984-1988.

	Adjusted[1] Tons/Acre											
					1988 Planting Date							
Line	1984 AV	1985 AV	1986 AV	1987 AV	5-19	6-12	6-20	6-27	7-5	1988 AV	1987-1988 AV	1984-1988 AV
Oregon 91G	8.1	7.6	9.9	10.0	6.1	4.6	6.0	8.8	10.7	7.2	8.6	8.6
5024-1-9[2]	8.0	6.3	10.4	9.6	6.5	6.2	6.2	7.9	8.4	7.0	8.6	8.3
5073	9.2	8.9	11.8	10.3	5.8	5.9	7.6	9.0	9.4	7.5	8.9	9.5
5090	8.4	6.4	10.4	9.4	5.9	3.9	6.5	7.4	9.2	6.6	8.0	8.2
5097	8.0	6.7	10.0	9.6	6.2	4.7	7.1	8.7	8.0	6.9	8.2	8.2
5163	9.2	6.4	11.5	10.8	6.5	6.5	7.3	8.3	7.6	7.2	9.0	9.0
5256	9.1	6.8	10.5	9.3	5.6	4.3	4.5	8.4	9.0	6.4	7.8	8.4
EZ Pick	---	6.2	9.2	6.8	4.3	5.3	5.8	7.3	6.8	5.9	6.4	7.0

[1]Adjusted to 50% 1-4 sieve except that in 1986, 1987, and 1988 5256 and 5163 were adjusted to 55% 1-4 sieve, and Easy Pick to 65% 1-4 sieve.

[2]In 1984 and 1985, 5024 was used instead of daughter line 5024-1-9.

Table 4. Fusarium root rot infection, Oregon State University, 1988

Line	Root vigor[1]			Disease incidence[2]			Notes
	rep. 1	rep. 2	Avg.	rep. 1	rep. 2	Avg.	
1604B	3	4	3.5	3.5	4.5	4.0	
91G	3	4	3.5	4.5	3	3.8	
5024-1-9	3	3	3.0	4	2.5	3.2	highly variable
5073	3	3	3.0	4.5	3.5	4.0	
5090	3	3	3.0	2	3	2.5	root rot covers root surface, but little penetration
5097	4	3	3.5	4.5	2	3.2	
5163	4	3	3.5	2.5	3	2.8	
5256	4	4	4.0	3.5	3.5	3.5	
5257	4	3	3.5	3	4	3.5	
5276	4	3	3.5	4	2.5	3.2	some plants v. bad infection (5's)
5386	4	4	4.0	4.5	4	4.2	
5387	3	4	3.5	3	3	3.0	
5394	3	5	4.0	5	2.5	3.8	poor stand
5402	2	1	1.5	3	2	2.5	highly variable
5404	2	4	3.0	5	3	4.0	poor stand, variable
5409	4	3	3.5	2	2.5	2.2	
5411	3			3.5			
Hystyle	4	2	3.0	3	3	3	uniform infection
EZ Pick	3	4	3.5	3	4	3.5	uniform infection
RO 168	3	3	3.0	4.5	3.5	4.0	variable, v. brittle roots
Roma 2	1	1	1.0	4	3	3.5	many new healthy roots
Evergreen	3	3	3.0	4.5	4	4.2	
DM3NY1	4	4	4.0	2	3	2.5	highly variable
DM4NY6	1	3	2.0	2.5	3	2.8	variable
DM6NY1	1	1.5	1.2	1.5	3.5	2.5	poor stand
B7023-31	2	3	2.5	4	3.5	3.8	
B7023-90	2			3			poor stand
B7023-96	3			2.5			
B7030-24	1	1	1.0	1.5	4	2.8	
B7030-40	3	2	2.5	3	2	2.5	variable, poor stand
Wis 46	3	3	3.0	3	3	3.0	
Wis 83	3			2			
RR4270	1	1	1.0	3	3.5	3.2	variable
RR6950	1	1	1.0	1	1.5	1.2	

[1]Root vigor scores, 1-5 scale, 1 = vigorous, 5 = weak.
[2]Disease incidence, 1-5 scale, 1 = trace, 5 = se[illegible]e.

Table 5. White mold infection, Oregon State University, 1988[1].

Line	rep. 1	rep. 2	rep. 3	rep. 4	Avg.
91G[2]	6	7	8	5	6.5
5024-1-9	9	9	5	6	7.2
5073	6	8	2	2	4.5
5090	8	7	4	4	5.8
5097	3	10	4	5	5.5
5163	2	7	7	5	5.2
5256	9	5	7	2	5.8
5257	6	4	2	3	3.8
5276	8	7	6	4	6.2
5386	5	8	9	7	7.2
5387	8	10	8	6	7.8
5394	10	9	7	4	7.5
5409	5	10	8	4	6.8
5411	10	7	8	2	6.8
Hystyle	1	4	8	2	3.8
EZ Pick	7	8	4	4	5.8
RO 168	10	8	6	8	8.0
Roma 2	3	7	4	9	5.8
Slenderette	5	5	7	3	5.0
Black Turtle	4	6	8	8	6.5
Taylor Dwarf Horticultural	3	1	4	4	3.0
Harvester	5	8	6	6	6.2
Evergreen	4	2	8	5	4.8
2235	3	1	5	4	3.2
L192	1	1	1	2	1.2
Aurora	9	7	9	5	7.5
Red Kidney	1	1	4	3	2.2
Cape	7	8	7	2	6.0
Tendercrop	7	4	9	7	6.8
Bountiful	1	4	4	4	3.2
Gabriella	9	2	3	1	3.8
Black Valentine	6	4	8	8	6.5
A55	1	1	1	1	1.0
Rabio de Gato	4	9	5	3	5.2
L162	1	2	1	1	1.2
XPB 266	1	6	3	1	2.8
NY 2558	1	8	3	1	3.2
XPB 155	7	9	7	8	7.8
Laureat	7	6	1	5	4.8
Flo	4	2	8	2	4.0
Ex Rico	5	8	7	2	5.5
169787	2	7	5	2	4.0
180753	3	1	4	1	2.2
204717	1	3	4	3	2.8
225846	1	1	1	2	1.2
226865	1	7	4	1	3.2
407463	4	5	7	1	4.2
415965	5	3	4	1	3.2
824775	2	3	2	1	2.0

Table 5. White mold infection, Oregon State University, 1988[1] (cont.).

Line	rep. 1	rep. 2	rep. 3	rep. 4	Avg.
B7126-1-1-1	4	1	5	3	3.2
B7126-33-1-2	3	3	4	1	2.8
B7126-33-2-1	5	3	1	2	2.8
B7126-54-2-1	4	5	2	1	3.0
B7127-2-1-1	4	3	1	2	2.5
B7127-2-3-1	3	4	2	1	2.5
B7127-19-1-1	2	3	2	3	2.5
B7127-26-1-1	5	8	4	5	5.5
B7127-40-2-1-4	5	6	5	4	5.0
B7127-61-1-1	4	5	3	5	4.2
B7127-61-2-1	1	7	5	3	4.0
B7127-68-1-1	4	4	3	3	3.5
B7127-73-4-1	4	1	1	1	2.0
B7127-76-2-1	1	8	1	1	2.8
B7127-76-3-1	7	6	3	4	5.0
B7127-76-3-2	5	3	5	5	4.5
B7127-80-2-1	4	3	3	3	3.2
B7127-95-3-1	3	5	6	7	5.2

[1]White mold scores, 1-10 scale, 1 = low incidence, sometimes slight symptoms; 10 = high incidence, usually severe symptons. Also included in white mold trial were 128 breeding lines from interspecific crosses with beans from David Mok's program, most of which scored an average of 4 to 6. Those lines with scores below 3 were saved for further evaluation.