

**Supplemental Report
to Oregon Processed Vegetable Commission
1989/90 Project period (Submitted July 1991)**

TITLE: Green Bean Breeding and Evaluation

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PROJECT STATUS: Continuing, indefinite

PROJECT FUNDING: Breeding \$39,000.
Processing \$11,450.

Funds allocated to the processing portion of this project were used for labor; purchase of supplies for processing, laboratory and sensory evaluation; secretarial and accounting and for travel.

I. Objectives:

1. Improved potential for high yields at favorable sieve sizes and dependability.
2. Improved straightness, texture and other quality factors.
3. Develop easy picking and small pod strains of Blue Lake type.
4. Resistance to white mold and root rot.

II. Processing Quality Evaluation:

Single harvest lines were harvested once and both canned (3 whole, 4 cut, 5 cut, 6 cut) and frozen (4+5 cut). Multi-harvest lines were harvested three to five times. Plantings I and V were canned (3,4,5, and 6 whole and 3+4, 5 and 6 cut) and Planting III was frozen (1+2, 3+4, and 5+6 whole and 1+2, 3+4 and 5+6 cut). Maturity was measured in all lines as the % of 1 to 4 sieve pods by weight in the size-graded field sample. Percent seed and fiber analyses were carried out on 5 or 6 sieve size beans of all samples.

Sensory analysis of the single harvest lines consisted of ratings by members of the industry during a cutting in February 1990. The industry evaluated the entire set of single and multi-harvest samples during one session. Multi-harvest lines were evaluated for sensory quality by both a trained OSU panel (August 1990) and an untrained industry panel (industry cutting, February 1990). The quality factors rated by the panels included the following: appearance, color, texture, flavor, overall liking and fleshing. Beans were rated on a nine point hedonic scale, with zero being dislike extremely and nine being like extremely. Sample preparation for both OSU

and industry panels consisted of serving the canned samples at room temperature while the frozen samples were blanched prior to serving.

III. Single Harvest Bean Lines

Twenty new round pod lines from Planting II were harvested and processed into both canned and frozen products. In addition, four standards or check varieties (including 2 flat Italian pod selections) were harvested once and processed for comparison. The lines were the following:

	<u>Numbered lines</u>		<u>Standards</u>
5408	5394	5073	Hystyle
5412	5405	5411	91G
5403	5386	5090B	Roma II
5417	5420	5404	Roma 350
5402	5408	5421	
5456	5163	5433	
5437	5416		

A. Canned Beans

The results for the industry panel evaluation of the canned pack appear in Table 1 and Figure 5. Overall quality scores ranged from 4.2 to 6.5 with the standard 91G rating 5.4. Most lines in fact rated higher than 91 G in overall quality, with 5402 and 5403 scoring significantly higher. The industry panel also scored these two lines higher than 91G in terms of appearance, color, texture and flavor. Line 5433 scored high in appearance and overall quality. Lines 5417 and Hystyle both scored poorly in appearance and overall quality. Hystyle was rated down for color and flavor, while 5417 was judged poorly for texture. Overall quality of flat Italian line Roma II was judged to be slightly better than Roma 350, but differences were not significant.

B. Frozen Beans

Table 2 and Figure 6 include results of the industry panel evaluation of frozen green beans. Overall quality scores ranged from 4.9 to 6.2, a narrower range than that seen in canned beans. The standard, 91G, received a score of 5.4 for overall quality, while 5402 and 5403 were rated 5.8 and 6.2, respectively. These two lines were rated higher in appearance, color, texture and flavor than 91G, which was also the case in the canned samples. Line 5433 received very low scores for appearance, color, flavor and overall quality. It is surprising that this line, which was scored high in the canned sample, did so poorly in the frozen product. The evaluation may have been affected by the fact that the sample contained 92% 1 to 4 sieves.

IV. Multi-Harvest Bean Lines

Five advanced bean lines and six industry standards were harvested three to five times, with Plantings I and V canned and Planting III frozen. Processed quality over the range of planting dates and crop maturities was assessed by the OSU panel, the industry panel and by analysis of seed and fiber in the larger sieved pods. The following were included in the multi-harvest evaluation study:

<u>Numbered lines</u>			<u>Standards</u>
5411	5256	5163	Hystyle
5417	5402		Blue Lake Pole
			Primo
			Roma II
			Roma 350
			91G

Sensory quality results for canned beans from Plantings I (July harvest) and V (August harvest), as evaluated by both the industry and OSU panel, are presented in Table 3. Results for frozen beans from Planting III are presented in Table 4. In order to simplify the discussion of results, the information in Tables 3 and 4 has been summarized into Tables 5 and 6. Table 5 lists only the highest and lowest scoring lines, and the quality attributes for which these bean lines scored either well or poorly. Table 6 summarizes this information even further, and lists those bean lines which scored either high or low in more than two quality attributes.

The same sensory information listed in Tables 3 and 4 (industry panels only) is displayed graphically in Figures 1 through 4. Because of the need for brevity, only five of the most interesting graphs of sensory quality attributes are displayed for canned and frozen round and flat Italian bean types. Beans were canned from both Planting I and V, and in order to represent this, a space has been left between harvests 1-3 (Planting I) and 4-6 (Planting V). The industry standard, 91G, was plotted in heavy type to emphasize its scores, but it is actually incorrect to compare this standard with the Italian type beans. In these graphs, 91G should be ignored.

Analytical results appear in Tables 7, 8 and 9. Percent seeds and fiber are reported for all three plantings. These analyses were carried out on sieve 5 or 6 canned and frozen beans in August, 1990.

A. General Comments

1. OSU panel scores were, in general, higher than those of the industry panel for canned beans and lower than the industry panel for frozen.
2. OSU and industry panels did not agree on highest rated samples in most cases. As shown in Table 6, the only time when both panels concurred on the highest rated line was in the case of frozen samples of 5402.

C. Frozen Beans

The industry rated 5402, 5256 and Roma II as the top-ranking frozen beans (Table 4). All three were rated consistently high in all quality attributes, with values being slightly higher overall for the round than the flat bean types. The lowest scoring lines in both canned and frozen products, as rated by the industry, were 5417 and Hystyle (Table 6). Figure 3 illustrates that 5402 was rated much higher than other lines at all maturities. Variety 91G was rated very poorly for appearance, but scored fairly well in all other attributes. Hystyle was obviously rated poorly in many attributes, including color, flavor and overall quality (Figure 3). The patterns shown with Italian beans (Figure 4) are not that clear, but it appears that Roma 350 was rated much higher at late harvest than early or mid. Primo, on the other hand, declined in quality with time (Figure 4).

The OSU panel rated 91G, 5402 and Roma 350 as the best frozen beans (Table 5), however quality attributes were not consistently good in these lines. Variety 91G scored well on texture and flavor in the 5 sieve cut beans, and in appearance, color, texture and fleshing in 3 whole beans. Line 5402 was rated high in terms of appearance, color and flavor in the 5 sieve cut and high in color, texture, flavor and fleshing in the 3 whole sieve bean. Roma 350 rated high in color, texture and flavor, while Primo was also desirable for appearance and fleshing.

V. Conclusions

Results from the industry panel indicate that single harvest bean lines 5402, 5403 and 5433 received the highest sensory scores in the canned product. Sensory scores for frozen 5433 beans were very low, however. In the frozen product, lines 5402 and 5403 were top-rated, followed by 5405, 5412 and 5437.

Multi-harvest sensory results differed greatly between industry and OSU panels and future evaluations should address these differences. In general, 5402 and Roma II were the highest rated beans by the industry panel, in both canned and frozen products. The OSU panel, on the other hand, rated 5163, 5417 and Roma II highest in the canned product and 91G, 5402 and Roma 350 highest in the frozen product. Percent seed was lowest in Hystyle and Roma 350, and highest in 5402 in both plantings. Fiber content was highest in 5417 and lowest in 5411 from both plantings.

Table 1. 1989 Canned Green Beans - Industry Panel, single harvest.
 Data for sample code, % 1-4 sieve, average and standard deviation (in parenthesis) for appearance, color, texture, flavor and overall quality.

Line	% 1-4 sieve	Appearance	Color	Texture	Flavor	Overall Quality
5073	41	5.6 (1.2)	5.8 (1.1)	5.9 (1.5)	5.8 (1.4)	5.7 (1.3)
5090	38	5.7 (1.2)	5.6 (1.1)	5.9 (1.5)	5.8 (1.4)	5.7 (1.2)
5163	59	5.3 (1.6)	5.4 (1.4)	5.3 (1.9)	5.8 (1.5)	5.3 (1.2)
5256	62	5.8 (1.7)	5.8 (1.3)	5.6 (1.7)	5.9 (1.7)	5.6 (1.7)
5386	42	5.2 (1.1)	5.6 (1.4)	6.1 (1.5)	6.0 (1.5)	5.8 (1.6)
5394	47	6.2 (0.8)	5.7 (0.9)	5.9 (1.2)	5.8 (1.3)	5.7 (0.9)
5402	57	6.7 (0.9)	6.7 (0.8)	6.2 (1.3)	6.2 (1.5)	6.5 (1.1)
5403	56	6.6 (1.3)	6.6 (1.3)	6.3 (1.3)	6.2 (1.7)	6.4 (1.2)
5404	57	5.4 (1.3)	6.1 (1.0)	5.4 (1.5)	5.8 (1.4)	5.6 (1.3)
5405	54	5.8 (1.5)	5.9 (1.4)	6.0 (1.2)	5.9 (1.2)	5.8 (1.1)
5408	56	5.4 (1.4)	5.4 (1.6)	5.4 (1.6)	5.8 (1.1)	5.3 (1.5)
5411	45	5.6 (1.3)	5.4 (1.6)	5.8 (1.3)	5.9 (1.1)	5.9 (1.2)
5412	56	5.2 (1.2)	5.5 (1.6)	5.5 (1.3)	5.6 (1.3)	5.1 (1.2)
5416	46	5.4 (1.0)	5.7 (0.9)	5.6 (1.3)	5.2 (1.8)	5.2 (1.0)
5417	54	4.9 (1.6)	5.8 (1.6)	4.4 (2.4)	5.0 (2.0)	4.2 (1.6)
5420	57	5.7 (1.6)	5.6 (1.4)	4.9 (1.9)	5.6 (1.5)	5.1 (1.5)
5421	55	5.8 (1.5)	5.4 (1.6)	5.7 (1.3)	5.7 (1.3)	5.4 (1.1)
5433	92	6.6 (1.2)	6.2 (1.2)	5.9 (1.6)	5.7 (1.4)	5.9 (1.0)
5437	89	5.3 (1.0)	5.6 (1.5)	6.0 (1.2)	5.3 (1.9)	5.4 (1.2)
Hystyle	46	4.9 (1.7)	3.9 (1.7)	5.4 (1.4)	4.6 (1.1)	4.2 (1.2)
91G	56	5.3 (1.6)	5.9 (1.4)	5.6 (1.1)	5.7 (1.1)	5.4 (1.0)
Roma II	77	5.7 (1.2)	5.5 (1.2)	5.7 (1.2)	5.4 (1.7)	5.4 (1.1)
Roma 350	70	5.5 (1.6)	5.0 (1.4)	5.0 (1.8)	5.4 (1.7)	5.2 (1.5)

Table 3. 1989 Canned Green Beans - Industry & OSU Panels. Multi-harvest, 5c
 Data for sample code, harvest date, % 1-4 sieve, average for appearance, color, texture, flavor, overall quality (industry panel) and fleshing (OSU panel).

Line	Harvest date	Industry Panel Average scores						OSU Panel Average Scores					
		% 1-4 sieve	Appear.	Color	Texture	Flavor	Overall Quality	Appear.	Color	Texture	Flavor	Fleshing	
5163	17-Jul	61.0	5.5	5.6	5.5	5.7	5.7	17-Jul	6.4	6.1	6.4	6.7	5.7
	19-Jul	42.0	5.8	6.1	5.9	6.0	5.9	19-Jul	6.7	5.8	5.8	6.7	5.7
	21-Jul	38.0	5.7	5.0	5.3	5.2	6.2	21-Jul	6.7	5.9	5.2	5.6	5.7
	21-Aug	60.0	6.1	5.7	6.1	5.9	6.0	21-Aug	6.7	6.8	6.0	6.4	5.7
	23-Aug	34.0	6.3	5.8	6.1	5.5	5.7	23-Aug	7.2	7.0	6.0	6.3	6.4
	25-Aug	29.0	5.6	5.4	5.2	5.1	5.2	25-Aug	6.9	7.4	5.8	6.0	6.3
5256	17-Jul	69.0	5.8	6.1	5.7	5.6	6.0	17-Jul	7.2	6.3	5.3	3.2	4.8
	19-Jul	57.0	5.6	6.0	5.3	5.7	5.9	19-Jul	5.9	5.4	5.7	5.2	4.9
	21-Jul	48.0	5.4	5.9	5.6	5.9	5.8	21-Jul	6.1	6.3	5.9	5.5	5.1
	21-Aug	63.0	6.0	5.9	5.8	5.8	5.9	21-Aug	7.1	6.3	6.8	6.4	6.8
	24-Aug	42.0	5.6	5.8	5.8	5.6	6.0	24-Aug	7.0	6.1	6.6	6.1	5.9
	26-Aug	33.0	5.4	5.6	5.5	5.4	5.5	26-Aug	6.7	6.3	6.2	5.9	5.8
5402	18-Jul	63.0	5.5	5.6	6.0	6.1	5.6	18-Jul	5.9	5.7	6.3	5.9	5.2
	20-Jul	53.0	5.9	5.9	6.0	6.3	6.0	20-Jul	6.3	6.2	6.2	5.8	5.2
	22-Jul	40.0	5.8	5.9	5.9	5.9	6.0	22-Jul	6.0	6.3	5.6	6.3	6.6
	22-Aug	57.0	5.9	5.9	6.0	6.1	6.0	22-Aug	6.6	5.8	6.3	5.8	6.9
	24-Aug	38.0	5.9	5.9	5.8	5.9	6.0	24-Aug	7.0	6.2	5.8	5.3	6.2
	26-Aug	30.0	5.8	5.6	5.9	5.9	6.0	26-Aug	6.4	5.9	6.2	5.9	6.9
5411	14-Jul	63.0	5.4	5.8	5.6	5.8	5.6						
	17-Jul	28.0	5.3	5.8	5.8	5.8	5.5	17-Jul	5.8	6.5	5.4	6.4	5.3
	19-Jul	21.0	4.9	5.6	5.9	5.8	5.4	19-Jul	6.0	6.2	6.1	6.0	4.8
	21-Aug	41.0	5.1	5.6	5.4	5.9	5.1	21-Aug	6.8	7.0	6.6	6.6	5.8
	23-Aug	22.0	5.1	5.5	5.8	5.8	5.1	23-Aug	6.7	6.5	6.5	5.9	5.8
	25-Aug	15.0	4.9	5.4	5.5	5.5	5.3	25-Aug	5.7	6.7	5.8	5.7	6.1
5417	17-Jul	66.0	4.5	5.2	4.7	4.7	4.7	17-Jul	5.9	6.9	6.7	6.1	5.9
	19-Jul	52.0	4.5	5.2	4.8	4.8	4.7	19-Jul	6.2	6.7	6.6	6.0	5.1
	21-Jul	43.0	4.7	5.0	4.8	4.8	4.8	21-Jul	5.7	6.6	5.4	5.8	5.4
	22-Aug	48.0	5.3	5.4	5.9	5.4	5.2	22-Aug	6.4	6.8	5.9	6.5	5.7
	24-Aug	32.0	5.1	5.7	5.9	5.6	5.4	24-Aug	6.8	6.9	5.5	5.9	5.6
	26-Aug	25.0	5.3	5.9	5.7	5.7	5.4	26-Aug	6.4	6.6	5.6	5.7	6.1
Hystyle	13-Jul	58.0	5.7	3.9	5.7	5.0	5.2	13-Jul	5.7	5.6	5.6	5.9	5.0
	15-Jul	49.0	5.4	4.0	5.7	5.3	5.4	15-Jul	5.9	5.4	5.8	5.3	4.4
	17-Jul	30.0	5.7	4.1	5.6	5.1	5.2	17-Jul	6.2	5.0	5.9	6.0	5.9
	21-Aug	36.0	5.6	4.0	5.6	5.6	5.4	21-Aug	7.4	5.0	6.3	6.2	6.8
	23-Aug	24.0	5.6	4.0	5.4	5.4	5.2	23-Aug	7.4	5.1	6.5	5.9	5.7
	25-Aug	17.0	5.6	4.1	5.6	5.0	5.2	25-Aug	7.2	4.9	5.7	5.3	6.5
91 G	15-Jul	71.0	5.4	6.0	5.6	6.0	5.8	15-Jul	5.8	5.8	6.1	6.4	4.7
	17-Jul	41.0	5.6	6.1	5.6	6.1	6.2	17-Jul	5.4	6.1	5.7	6.2	4.8
	19-Jul	33.0	5.6	6.4	5.7	6.1	6.4	19-Jul	5.3	5.6	5.6	5.8	4.8
	21-Aug	44.0	5.9	6.3	5.6	6.1	6.4	21-Aug	5.2	6.0	6.1	6.6	5.4
	23-Aug	29.0	6.0	6.3	6.0	6.1	6.4	23-Aug	5.7	6.4	6.1	6.4	6.3
	25-Aug	20.0	5.7	6.3	5.7	6.1	6.1	25-Aug	6.0	6.0	6.3	6.1	5.1
Primo	13-Jul	86.0	5.7	5.4	5.7	5.6	6.2						
	15-Jul	76.0	5.6	5.6	5.7	5.3	6.0	15-Jul	7.0	6.3	5.5	5.8	6.3
	17-Jul	47.0	-1.6	5.4	5.6	5.4	5.8	17-Jul	6.7	6.2	6.1	6.9	7.0
	24-Jul	59.0	5.6	5.4	5.7	5.3	6.2						
	21-Aug	46.0	5.8	5.8	5.8	5.7	6.3	21-Aug	7.4	5.3	6.1	5.8	6.0
	23-Aug	27.0	6.0	5.7	6.0	5.5	6.5	23-Aug	6.6	5.2	5.8	6.3	6.3
25-Aug	22.0	5.3	5.7	5.8	5.5	6.3	25-Aug	7.0	5.6	5.7	5.7	6.2	
Roma II	17-Jul	71.0	5.8	6.2	6.2	6.3	6.5	17-Jul	6.7	5.7	6.0	5.7	5.5
	19-Jul	66.0	6.0	6.0	6.3	6.2	6.5	19-Jul	6.5	5.5	5.8	5.9	6.3
	21-Jul	50.0	5.8	7.0	6.8	6.8	7.5	21-Jul	6.3	5.4	5.7	5.3	6.5
	21-Aug	78.0	6.0	6.0	6.3	6.3	6.5	21-Aug	6.5	4.6	6.7	6.1	6.2
	23-Aug	56.0	5.7	5.8	6.0	6.0	6.5	23-Aug	6.3	4.6	6.1	6.1	6.4
	25-Aug	43.0	5.7	5.7	6.0	6.0	6.5	25-Aug	6.5	4.2	6.1	6.1	6.1
Roma 350	17-Jul	79.0	6.2	6.7	6.2	6.2	6.8						
	19-Jul	76.0	6.0	6.5	6.0	6.2	6.5	19-Jul	6.5	5.1	5.5	3.8	5.7
	21-Jul	91.0	5.6	6.7	5.8	6.0	6.5	21-Jul	6.3	5.9	5.8	6.4	5.4
	21-Aug	81.0	5.7	6.7	6.0	6.0	6.8	21-Aug	6.5	4.7	5.3	5.8	5.4
	23-Aug	71.0	5.8	6.8	6.0	6.0	6.5	23-Aug	6.2	4.4	5.8	5.6	5.6
	25-Aug	60.0	5.8	6.7	5.8	5.8	6.8	25-Aug	5.9	4.1	4.7	5.7	5.2
Blue L.P.	14-Aug	*	6.8	7.4	7.0	6.8	7.3						
	21-Aug	*	7.2	7.4	7.2	7.0	7.7	21-Aug	5.6	5.9	6.9	6.2	6.8

Table 4. 1989 Frozen Green Beans - Industry & OSU Panels. Multi-harvest, 5c
 Data for sample code, harvest date, % 1-4 sieve, average for appearance, color, texture, flavor, overall quality (industry panel) and fleshing (OSU panel).

Line	Harvest date	Industry Panel Average Scores						OSU Panel Average Scores					
		% 1-4 sieve	Appear.	Color	Texture	Flavor	Overall Quality	Harvest date	Appear.	Color	Texture	Flavor	Fleshing
5163	5-Aug	70	5.3	5.5	5.4	5.2	5.5	5-Aug	6.8	6.4	6.3	5.9	5.4
	7-Aug	37	5.2	5.5	5.2	5.3	5.3	7-Aug	7.0	6.3	6.3	6.3	5.4
	9-Aug	45	5.3	5.5	5.3	5.3	5.3	9-Aug	6.2	5.6	6.5	6.2	5.1
5256	5-Aug	76	6.0	6.1	5.4	5.9	6.1	5-Aug	6.9	7.6	6.3	6.0	5.8
	7-Aug	67	6.0	5.9	5.2	5.3	6.1	7-Aug	7.1	7.2	6.3	6.4	5.7
	9-Aug	54	5.6	5.7	5.3	5.4	5.5	9-Aug	7.3	7.4	6.0	6.6	6.0
5402	7-Aug	68	6.3	6.5	6.1	5.5	6.2	7-Aug	7.2	7.2	6.0	6.6	5.3
	9-Aug	41	6.3	6.4	5.9	5.4	6.2	9-Aug	6.9	7.3	6.6	6.3	5.6
	11-Aug	35	6.1	6.0	5.7	5.3	5.8	11-Aug	7.7	7.7	6.2	6.6	6.0
5411	4-Aug	66	5.2	5.3	5.1	5.0	5.1	4-Aug	6.2	6.1	6.1	5.7	4.6
	7-Aug	•	•	•	•	•	•	7-Aug	6.0	6.4	6.4	6.2	5.2
	11-Aug	37	4.9	5.0	5.2	5.1	5.1	11-Aug	•	•	•	•	•
5417	7-Aug	50	5.4	5.0	4.9	4.9	5.0	7-Aug	6.1	6.0	5.9	6.0	4.5
	9-Aug	34	5.3	5.4	4.9	4.9	4.9	9-Aug	5.6	6.1	5.9	6.0	5.5
	11-Aug	33	5.0	5.0	4.6	5.0	4.8	11-Aug	6.1	6.3	6.0	5.4	5.4
Hystyle	4-Aug	54	4.6	3.7	4.5	4.0	4.1	4-Aug	6.5	5.0	6.3	5.5	5.8
	7-Aug	47	4.8	3.7	4.5	3.9	4.2	7-Aug	6.5	4.4	6.1	5.6	6.0
	9-Aug	41	4.7	3.7	4.7	4.2	4.2	9-Aug	7.0	4.7	6.2	6.0	6.9
91 G	5-Aug	52	4.6	5.7	5.3	5.6	5.7	5-Aug	6.8	6.9	6.3	6.0	5.7
	7-Aug	42	4.8	5.7	5.7	5.5	5.7	7-Aug	6.9	6.8	6.7	6.8	5.2
	9-Aug	25	4.7	5.3	5.3	5.2	5.3	9-Aug	7.3	7.2	6.2	6.9	5.9
Blue L.P.	11-Aug	•	7.1	6.9	6.6	6.5	6.9	11-Aug	•	•	•	•	•
Primo	2-Aug	73	5.4	5.7	5.4	5.3	5.6	2-Aug	5.9	5.8	5.8	5.9	5.3
	4-Aug	62	5.3	5.3	5.3	5.1	5.2	4-Aug	6.1	6.4	6.0	5.8	5.7
	7-Aug	55	5.3	5.3	5.4	5.1	5.3	7-Aug	5.8	5.6	6.4	6.4	4.8
Roma II	2-Aug	84	5.6	5.7	5.6	5.6	5.6	2-Aug	6.0	5.3	5.8	5.8	5.3
	4-Aug	78	5.9	5.8	5.7	5.7	5.8	4-Aug	6.3	5.2	5.9	5.9	5.2
	7-Aug	62	5.7	5.5	5.4	5.5	5.5	7-Aug	6.0	5.2	6.1	5.9	5.9
Roma 350	2-Aug	85	5.0	5.3	5.0	5.2	5.0	2-Aug	•	•	•	•	•
	4-Aug	77	5.7	5.4	5.5	5.6	5.6	4-Aug	5.8	6.4	6.0	6.0	5.1
	7-Aug	73	5.4	5.5	5.6	5.5	5.3	7-Aug	6.0	5.7	6.3	5.9	6.0

Table 5. Sensory quality attributes of highest ranking OSU bean lines, 1989.

Commodity	Processing Style	Size	Panel	Highest Scoring Lines				
				Appear	Color	Texture	Flavor	Overall
Beans	Canned	5c	Industry	5402, 91G	91G, 5402	5402, 5163	91G, 5402	91G, 5402
		5c	OSU	5163, 5256	5417, 5163	5256, 5411	5163, 91G	---
		5c Italian	Industry	---	Roma 350	Roma II	Roma II	Roma 350
		5c Italian	OSU	Primo	Primo	Roma II	Primo	---
		3W	OSU	5163, Hystyle	5417, 5163	5417 5163	5411, 5417	---
		3W Italian	OSU	Primo	Primo	Roma II	Roma II	---
	Frozen	5c	Industry	5402, 5256	5402, 5256	5402	5256, 5402	5402, 5256
		5c	OSU	5402, 5256	5402, 5163	91G, 5163	91G, 5402	Hystyle, 5256
		5c Italian	Industry	Roma II	Primo	Roma 350	Roma 350	---
		5c Italian	OSU	Primo	Roma 350	Roma 350	Roma 350	---
		3W	OSU	Hystyle, 91G	5256, 5402, 91G	91G, 5256, 5402	5256, 5402	---
		3W Italian	OSU	Primo	Roma 350	Roma 350	Roma 350	---

Table 6. Highest and lowest sensory scores for OSU green bean lines, 1989.

Processing Style	Type of Panel	Highest Scoring Lines	Lowest Scoring Lines
Canned	Industry	5402, 91G/Roma II	5417,Hystyle/Roma 350
	OSU	5163, 5417 (3W)/Roma II	91G,Hystyle (3W)/Roma 350
Frozen	Industry	5402, 5256/Roma II	5417,Hystyle/Primo
	OSU	91G, 5402/Roma 350	5417, 5411/Roma II

Table 9. Frozen green bean analytical results, sives 5 + 6. (Planting III)

Sample Code	Harvest Date	% 1-4 Sieve	n	Average % Seed	Average % Fiber
Primo	8/2	73	2	1.4	0.008
Primo	8/4	62	2	1.6	0.008
Primo	8/7	55	2	3.4	0.011
Roma 2	8/2	84	2	1.6	0.008
Roma 2	8/4	78	2	1.9	0.008
Roma 2	8/7	62	2	5.2	0.010
Roma 350	8/2	85	2	1.0	0.009
Roma 350	8/4	77	2	1.3	0.010
Roma 350	8/7	73	2	2.4	0.011
Hystyle	8/4	54	2	1.9	0.010
Hystyle	8/7	47	2	4.0	0.011
Hystyle	8/9	31	2	6.7	0.015
5411	8/4	66	2	3.4	0.008
5411	8/7	37	2	5.8	0.009
5163*	8/5	70	2	4.4	0.008
5163*	8/7	61	2	6.9	0.011
5163	8/9	45	2	10.7	0.013
5256*	8/5	76	2	4.3	0.009
5256*	8/7	67	2	6.7	0.012
5256	8/9	54	2	9.3	0.016
91G	8/5	52	2	4.7	0.009
91G	8/7	42	2	7.5	0.011
91G	8/9	25	2	8.9	0.017
5402*	8/7	68	2	6.0	0.011
5402*	8/9	41	2	7.8	0.013
5402	8/11	35	2	11.3	0.013
5417*	8/7	50	2	5.1	0.015
5417	8/9	34	2	8.1	0.022
5417	8/11	33	2	9.6	0.029
Blue* Lake Pole	8/11	?	2	6.0	0.009

* 5 sieves

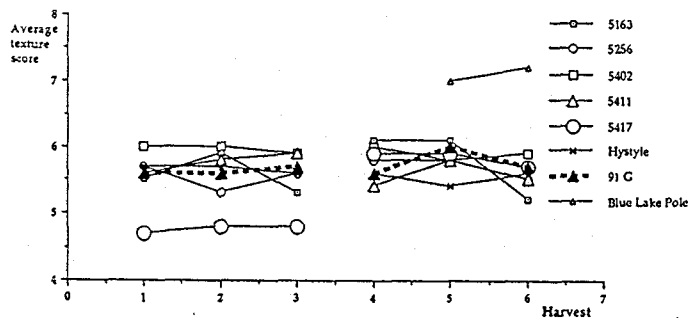
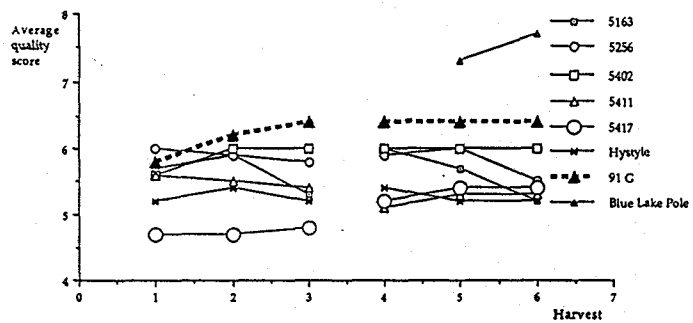
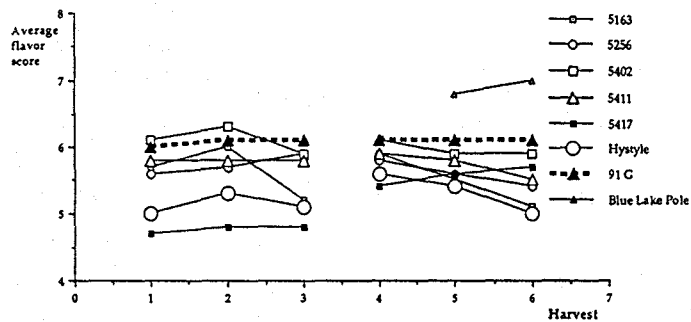
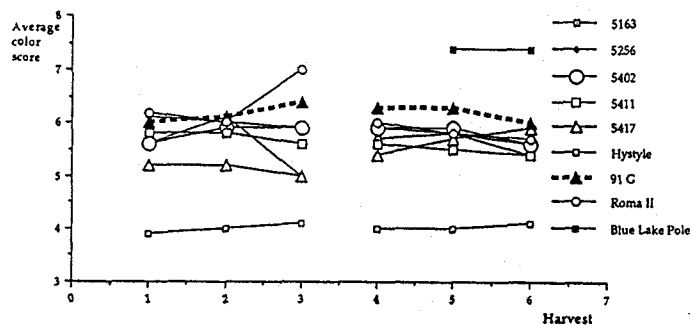
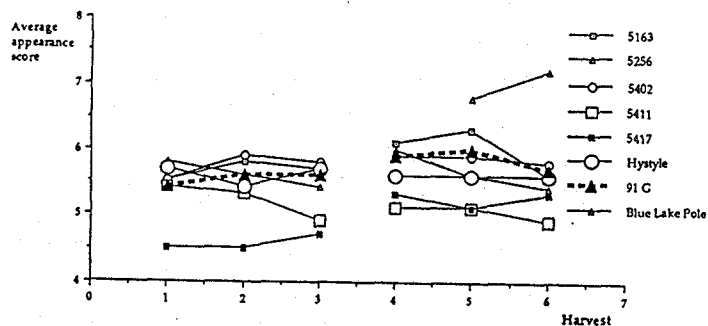


Figure 1. Sensory results for 1989 canned green beans, industry panel, 5 sieve cut.

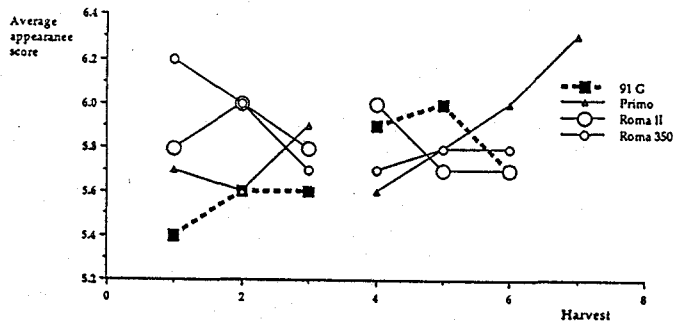


Figure 2. 1989 Canned Italian Green Beans - Industry Panel, Sc. Average appearance score

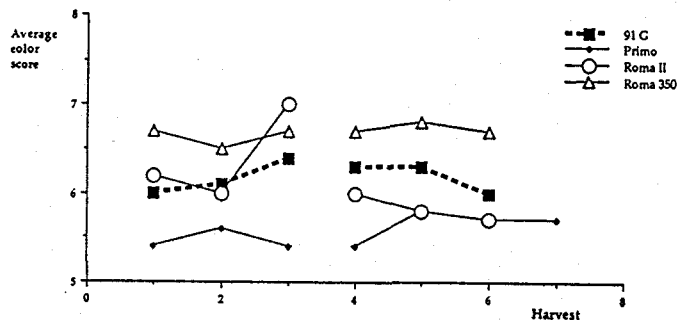


Figure 4. 1989 Canned Italian Green Beans - Industry Panel, Sc. Average color score.

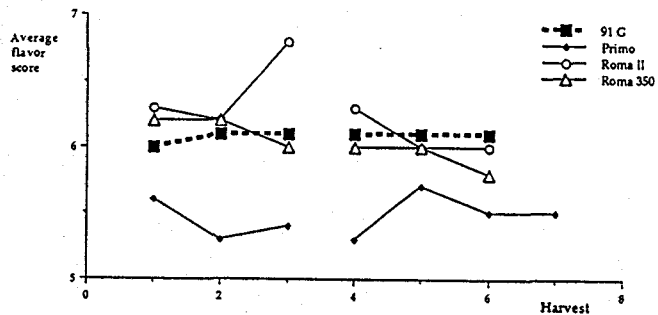


Figure 6. 1989 Canned Italian Green Beans - Industry Panel, Sc. Average flavor score.

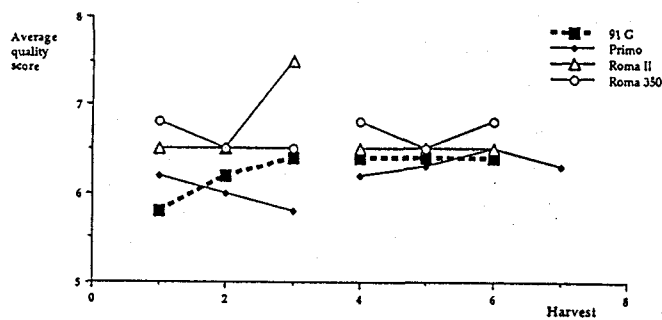


Figure 8. 1989 Canned Italian Green Beans - Industry Panel, Sc. Average quality score.

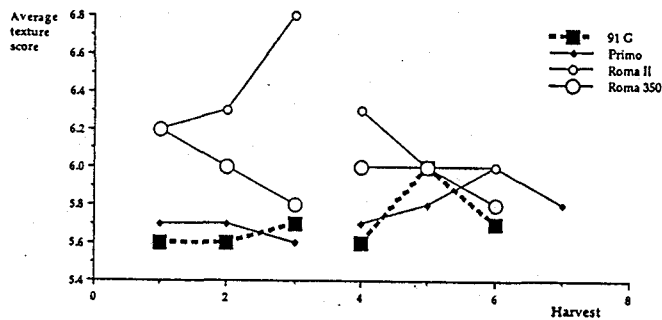


Figure 10. 1989 Canned Italian Green Beans - Industry Panel, Sc. Average texture score.

Figure 2. Sensory results for 1989 canned Italian green beans, industry panel, 5 sieve cut.

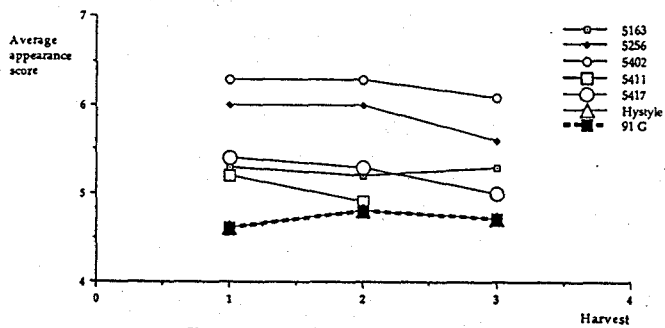


Figure 11. 1989 Frozen Green Beans - Industry Panel, Sc. Average appearance score.

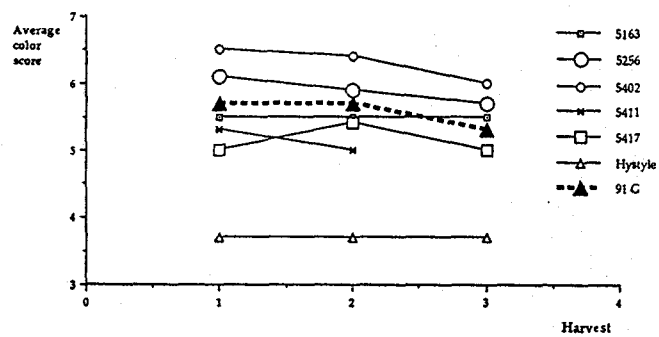


Figure 13. 1989 Frozen Green Beans - Industry Panel, Sc. Average color score.

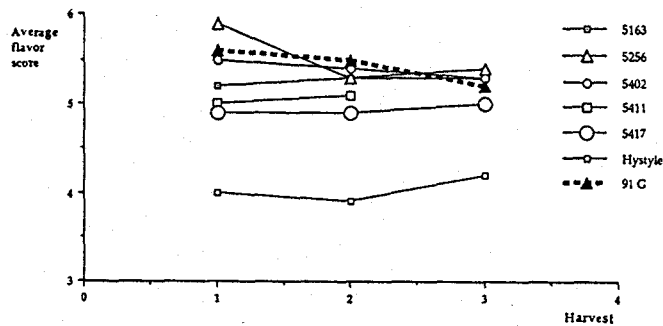


Figure 15. 1989 Frozen Green Beans - Industry Panel, Sc. Average flavor score.

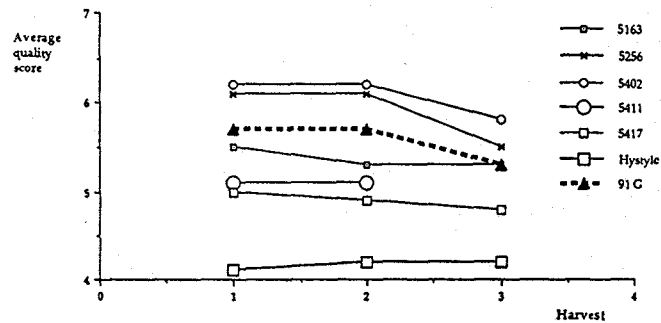


Figure 17. 1989 Frozen Green Beans - Industry Panel, Sc. Average quality score.

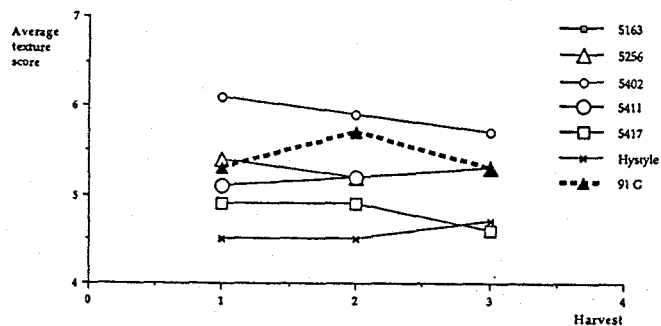


Figure 19. 1989 Frozen Green Beans - Industry Panel, Sc. Average texture score.

Figure 3. Sensory results for 1989 frozen green beans, industry panel, 5 sieve cut.

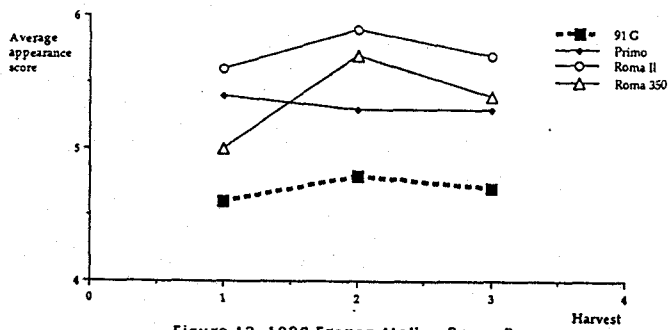


Figure 12. 1989 Frozen Italian Green Beans - Industry Panel, Sc. Average appearance score.

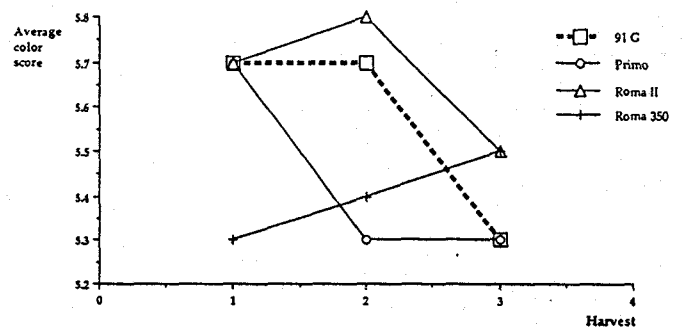


Figure 14. 1989 Frozen Italian Green Beans - Industry Panel, Sc. Average color score.

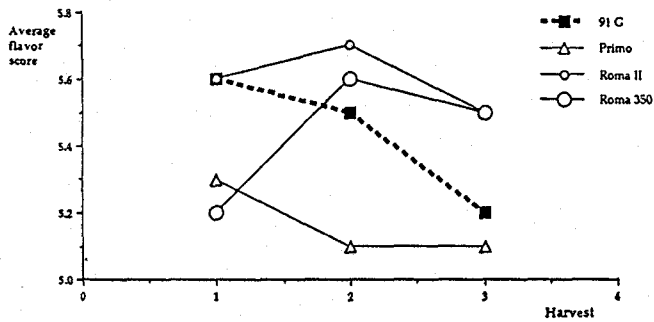


Figure 16. 1989 Frozen Italian Green Beans - Industry Panel, Sc. Average flavor score.

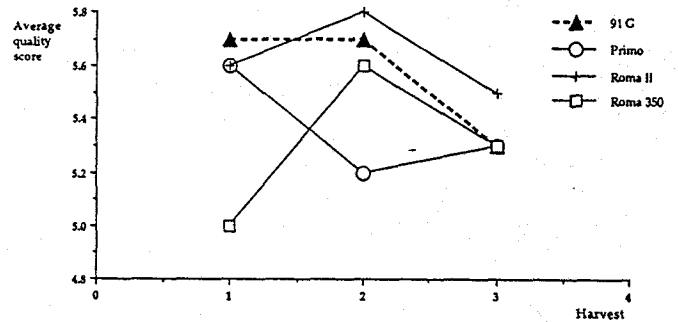


Figure 18. 1989 Frozen Italian Green Beans - Industry Panel, Sc. Average quality score.

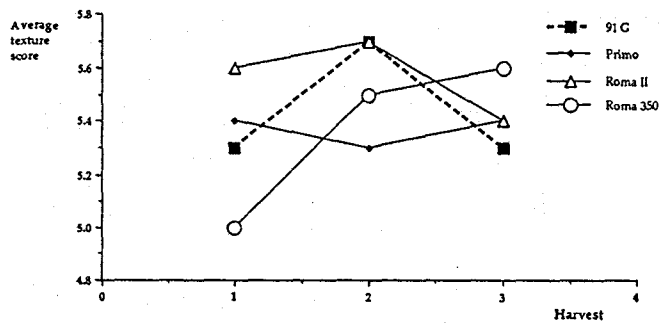


Figure 20. 1989 Frozen Italian Green Beans - Industry Panel, Sc. Average texture score.

Figure 4. Sensory results for 1989 frozen Italian green beans, industry panel, 5 sieve cut.

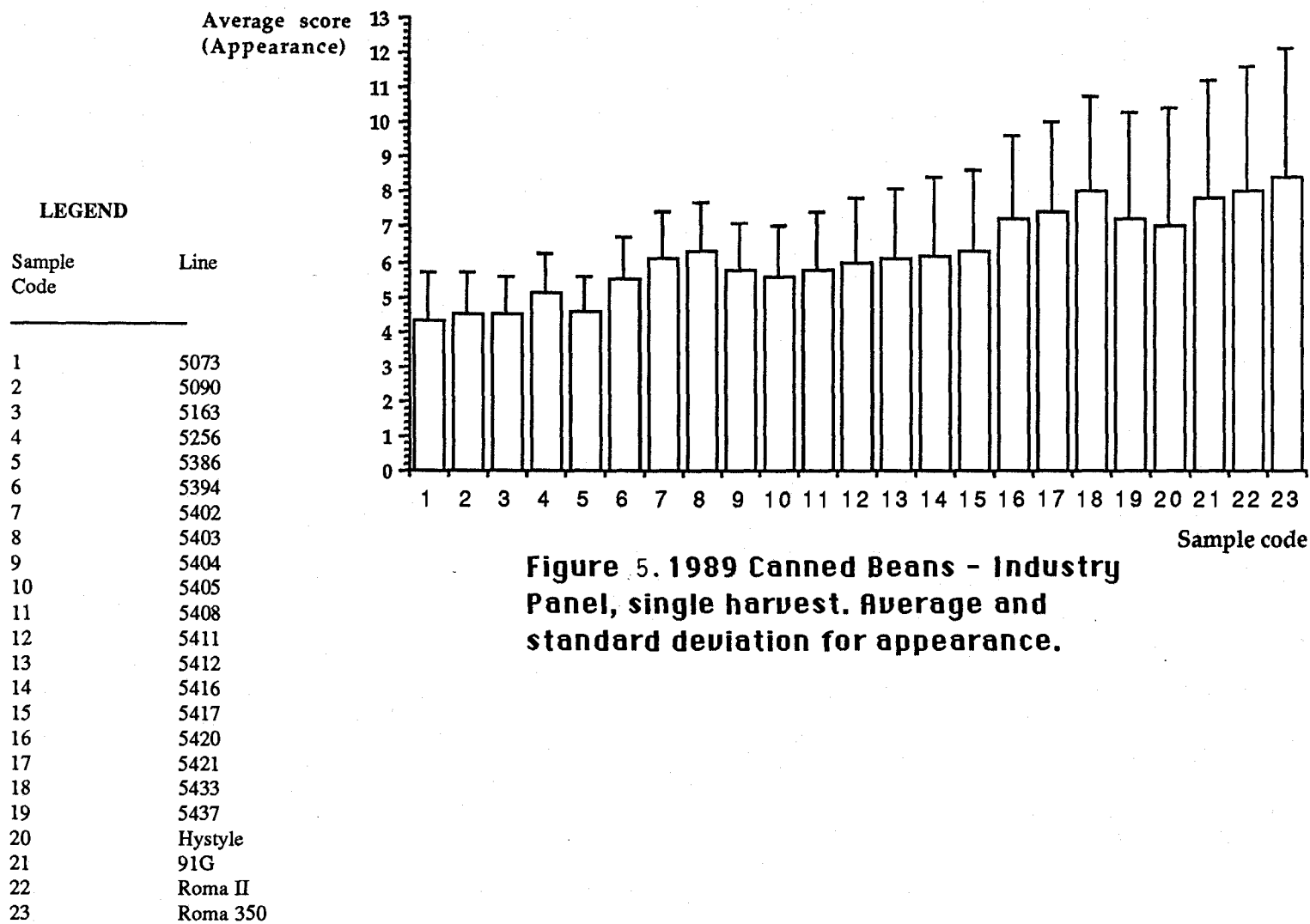


Figure 5. 1989 Canned Beans - Industry Panel, single harvest. Average and standard deviation for appearance.

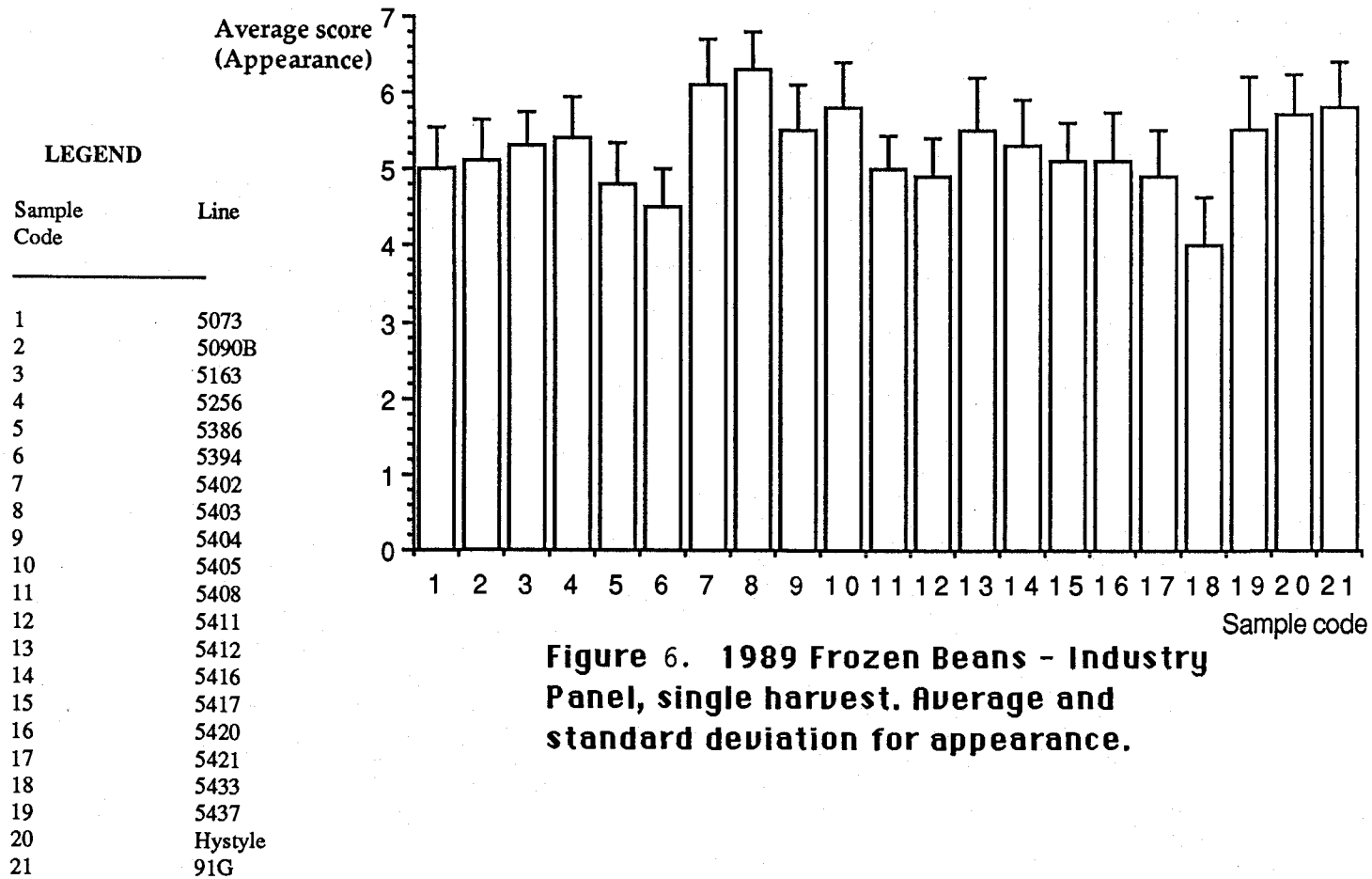


Figure 6. 1989 Frozen Beans - Industry Panel, single harvest. Average and standard deviation for appearance.