Title: Green Bean breeding and evaluation.

Project Leaders: J.R. Baggett, Horticulture
D.M. Barrett, Food Science and Technology

Project Status: Terminated June 30, 1991

Project Funding: 39,000 breeding
25,000 breeding supplementary technical support
14,355 processing

Processing funds were used for student labor and supplies required for processing samples of experimental beans, laboratory analysis and panel evaluations.

Objectives: Breed bush green beans for the Western Oregon processing industry with:

- a) improved potential for high yields at favorable sieve dependability,
- b) improved straightness, texture, and other quality factors,
- c) emphasis on easy picking and small pod strains of Blue Lake type,
- d) resistance to white mold and root rot.


During the summer of 1990, 15 experimental OSU green bean lines (including two small sieve lines), two commercial small sieve varieties, and Oregon 91G were processed for evaluation (Planting I). Seven of the OSU lines and 91G were subjected to further evaluation. These lines were processed approximately every two days for three plantings (Plantings II, IV, and V). Canned beans were produced from Plantings I, II, and V. Frozen samples were produced from Plantings I and IV.

The sensory analysis was performed by a volunteer industry panel. Whole bean samples were displayed of sieves 3-6 and samples of cut 5 sieve beans were presented for tasting. Quality factors rated by the panel were: appearance, color, flavor, texture, and overall quality. A 1 to 9 point scale was used with 1 being "unacceptable" and 9 being "superior." Scores were averaged and the standard deviations calculated for each sample and attribute. The values are shown in Tables 1-4 and depicted in Figures 1-20. Table 5 shows the % seed and fiber for the seven OSU lines and 91G in the multiharvest trial.
Thirteen ballots were completed for the canned product and fifteen for the frozen. Unfortunately, this number of panelists is too small to show statistically significant differences between almost any of the samples. The fact that many of the experimental beans are closely related makes discrimination between samples difficult under the best circumstances. A larger number of panelists is clearly needed to make the sensory analysis useful.

Single Harvest

The lines and varieties included in the single harvest trial were:

<table>
<thead>
<tr>
<th>Oregon 91G</th>
<th>OSU 5163</th>
<th>OSU 5256</th>
<th>OSU 5384</th>
<th>OSU 5386</th>
<th>OSU 5402</th>
<th>OSU 5403</th>
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<td>OSU 5404</td>
<td>OSU 5405</td>
<td>OSU 5408</td>
<td>OSU 5416</td>
<td>OSU 5418</td>
<td>OSU 5420</td>
<td>OSU 5421</td>
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Canned: High scoring lines in appearance were OSU 5408 and BBL 76-110. The low standard deviation for the 5408 appearance score indicates more agreement among panelists about their sample than most others. High standard deviations for several attributes for BBL 76-110 indicate some disagreement about this sample. However, 76-110 generally scored the highest of the small sieve lines. OSU 5386 scored relatively high in color, texture, and overall quality.

Frozen: OSU 5256 scored the highest of the standard size beans in all categories. OSU 5386 had the lowest scores in all attributes. In flavor, texture, and overall quality, the scores for 5386 were even statistically less than the highest scoring lines. Of the small sieve lines, BBL 76-110 had the highest appearance score, but had flavor, texture, and overall quality scores that were very low, statistically less than all the other small sieve lines. B7184 had the highest color, flavor, and overall quality scores of all the frozen beans in the single harvest trial, standard and small sieve lines.

Multi-Harvest

The following beans were included in the multiharvest trial:

<table>
<thead>
<tr>
<th>Oregon 91G</th>
<th>OSU 5163</th>
<th>OSU 5256</th>
<th>OSU 5402</th>
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<td>OSU 5405</td>
<td>OSU 5416</td>
<td>OSU 5421</td>
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</table>
Canned: Oregon 91G was given the lowest appearance, color, texture, and overall quality scores. OSU 5163 and 5256 had high appearance and color scores but low to moderate flavor and overall quality scores. OSU 5402 had highest appearance, flavor and overall quality scores and scored high in color. OSU 5421 had the highest color and texture scores and scored high in appearance and overall quality. OSU 5405 had the lowest color and overall quality scores.

Frozen: Oregon 91G scored relatively better as a frozen bean than as a canned bean; it was neither high nor low in any attribute. OSU 5402 scored highest in all categories. In appearance, color, and overall quality the scores for OSU 5402 were statistically different than some of the lowest scoring samples. OSU 5416 had the lowest scores in appearance, color, flavor, and overall quality and a very low score in texture.

**Summary**

<table>
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<tr>
<th>Highest Scoring Lines</th>
<th>Process/Trial</th>
<th>Lowest Scoring Lines</th>
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<tr>
<td>OSU 5408, BBL 76-110</td>
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<td>OSU 5420, B7206</td>
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<tr>
<td>OSU 5402, OSU 5421</td>
<td>canned, multi-harvest</td>
<td>Oregon 91G</td>
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<td>B7184, OSU 5256</td>
<td>frozen, single harvest</td>
<td>OSU 5386, BBL 76-110</td>
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<td>frozen, multi-harvest</td>
<td>OSU 5416</td>
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The two most important conclusions from this year's work are:

1. OSU 5402 was the only line to score at the top for both canned and frozen products.
2. More panelists are needed to obtain statistically significant results.
Table 1. 1990-91 Canned Green Beans - Industry Panel, single harvest.
Data for days to harvest, % 1-4 sieve, average and standard deviation (in parenthesis) for appearance, color, flavor, texture and overall quality. Planting date: April 20, 1990.

<table>
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<tr>
<th>Line</th>
<th>Days to harvest</th>
<th>% 1-4 sieve</th>
<th>Appearance</th>
<th>Color</th>
<th>Flavor</th>
<th>Texture</th>
<th>Overall Quality</th>
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Small sieve

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<th>% 1-4 sieve</th>
<th>Appearance</th>
<th>Color</th>
<th>Flavor</th>
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Small sieve
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Table 3. 1990-91 Canned Green Beans - Industry Panel, multi-harvest. Data for planting date, harvest date, % 1-4 sieve, days planted, average and standard deviation (in parenthesis) for appearance, color, flavor, texture and overall quality.

<table>
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<th>Line</th>
<th>Planting date</th>
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<th>% 1-4 sieve</th>
<th>Days</th>
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Table 4. 1990-91 Frozen Green Beans - Industry Panel, multi-harvest. Data for harvest date, % 1-4 sieve, days planted, average and standard deviation (in parenthesis) for appearance, color, flavor, texture and overall quality. Planting date: June 4, 1990.

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Figure 1. 1990-91 Canned Green Beans - Industry Panel, Single Harvest, Mean Appearance Scores
Figure 2. 1990-91 Canned Green Beans - Industry Panel, Single Harvest, Mean Color Scores
Figure 3. 1990-91 Canned Green Beans - Industry Panel, Single Harvest, Mean Flavor Scores
Figure 4. 1990-91 Canned Green Beans - Industry Panel, Single Harvest, Mean Texture Scores
Figure 5. 1990-91 Canned Green Beans - Industry Panel, Single Harvest, Mean Overall Quality Scores
Figure 6. 1990-91 Frozen Green Beans - Industry Panel, Single Harvest, Mean Appearance Scores
Figure 7. 1990-91 Frozen Green Beans - Industry Panel, Single Harvest, Mean Color Scores
Figure 8. 1990-91 Frozen Green Beans - Industry Panel, Single Harvest, Mean Flavor Scores
Figure 9. 1990-91 Frozen Green Beans - Industry Panel, Single Harvest, Mean Texture Scores
Figure 10. 1990-91 Frozen Green Beans - Industry Panel, Single Harvest, Mean Overall Quality Scores
Figure 11. 1990-91 Canned Green Beans - Industry Panel, Multi-Harvest, Mean Appearance Score
Figure 12. 1990-91 Canned Green Beans - Industry Panel, Multi-Harvest, Mean Color Score
Figure 13. 1990-91 Canned Green Beans - Industry Panel, Multi-Harvest, Mean Flavor Score.
Figure 14. 1990-91 Canned Green Beans - Industry Panel, Multi-Harvest, Mean Texture Score
Figure 15. 1990-91 Canned Green Beans - Industry Panel, Multi-Harvest, Mean Overall Quality Score.
Figure 16. 1990-91 Frozen Green Beans - Industry Panel, Multi-Harvest, Mean Appearance Score
Figure 17. 1990-91 Frozen Green Beans - Industry Panel, Multi-Harvest, Mean Color Score

Days after June 4 planting
Figure 18. 1990-91 Frozen Green Beans - Industry Panel, Multi-Harvest, Mean Flavor Score
Figure 19. 1990-91 Frozen Green Beans - Industry Panel, Multi-Harvest, Mean Texture Score

Mean Texture Score

Days after June 4 planting

- 91 G
- 5163
- 5256
- 5402
- 5403
- 5405
- 5416
- 5421
Figure 20. 1990-91 Frozen Green Beans - Industry Panel, Multi-Harvest, Mean Overall Quality Score
Figure 1. 1990-91 Canned Green Beans - Industry Panel, Single Harvest, Mean Appearance Scores

Figure 2. 1990-91 Frozen Green Beans - Industry Panel, Single Harvest, Mean Color Scores

Figure 3. 1990-91 Canned Green Beans - Industry Panel, Single Harvest, Mean Flavor Scores

Figure 4. 1990-91 Canned Green Beans - Industry Panel, Single Harvest, Mean Texture Scores

Figure 5. 1990-91 Canned Green Beans - Industry Panel, Single Harvest, Mean Overall Quality Scores
Figure 6. 1990-91 Frozen Green Beans - Industry Panel, Single Harvest, Mean Appearance Scores

Figure 7. 1990-91 Frozen Green Beans - Industry Panel, Single Harvest, Mean Color Scores

Figure 8. 1990-91 Frozen Green Beans - Industry Panel, Single Harvest, Mean Flavor Scores

Figure 9. 1990-91 Frozen Green Beans - Industry Panel, Single Harvest, Mean Texture Scores

Figure 10. 1990-91 Frozen Green Beans - Industry Panel, Single Harvest, Mean Overall Quality Scores
Figure 11. 1990-91 Canned Green Beans - Industry Panel, Multi-Harvest, Mean Appearance Score

Figure 12. 1990-91 Canned Green Beans - Industry Panel, Multi-Harvest, Mean Color Score

Figure 13. 1990-91 Canned Green Beans - Industry Panel, Multi-Harvest, Mean Flavor Score

Figure 14. 1990-91 Canned Green Beans - Industry Panel, Multi-Harvest, Mean Texture Score

Figure 15. 1990-91 Canned Green Beans - Industry Panel, Multi-Harvest, Mean Overall Quality Score.
Figure 16. 1990-91 Frozen Green Beans - Industry Panel, Days after planting, Multi-Harvest, Mean Appearance Score.

Figure 17. 1990-91 Frozen Green Beans - Industry Panel, Days after June 4th, Multi-Harvest, Mean Color Score.

Figure 18. 1990-91 Frozen Green Beans - Industry Panel, Days after June 4th, Multi-Harvest, Mean Flavor Score.

Figure 19. 1990-91 Frozen Green Beans - Industry Panel, Days after June 4th, Multi-Harvest, Mean Texture Score.

Figure 20. 1990-91 Frozen Green Beans - Industry Panel, Days after June 4th, Multi-Harvest, Mean Overall Quality Score.