

432/1400
2015

NCARS/NCCES CODE: NC-32
ON CAMPUS RESEARCH
REPORT PERIOD: 1/1/2016-06/30/2017

**ANNUAL PROGRESS REPORT
TO
NORTH CAROLINA PEANUT GROWERS ASSOCIATION, INC.**

TITLE: Improvement of Sensory Quality and Composition of virginia-Type Peanuts
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DEPARTMENT(S): Crop and Soil Sciences
REPORT:

This project monitors the flavor intensity of breeding lines under consideration for cultivar release by the breeding program at NCSU. All potential new releases are subjected to a more or less long-term evaluation of flavor. We find that in order to obtain reliable mean sensory panel values for a line, one must have samples from at least three crop years, so the mean values for lines tested for a first or second year in a given year must be viewed as preliminary ones subject to change as more data is accumulated. Our ultimate objective is to make sure that the lines we do release for use as cultivars are superior in terms of flavor or at least do not have less intense "positive" flavor or more intense "negative" flavor compared with standard cultivars. For submission to the sensory panel or "flavoring" in 2016, we chose 207 samples from the 2015 NCSU variety trials including 38 virginia-type breeding lines based on their agronomic performance and disease reactions. For purposes of comparison we included as checks in the set samples of five virginia-type cultivars (Bailey, Emery, Sugg, Sullivan, and Wynne) and six runner-type cultivars (Florun™ '107', Georgia Green, Georgia-06G, Georgia-09B, TUFRunner™ '511', and TUFrunner™ '727'). The runner-type cultivars were, are, or may become the dominating cultivars in the Southeastern production area and are therefore included as flavor checks. Lines tested included 176 SMK samples representing these lines (31 samples were re-roasted to achieve a more nearly optimum roast color), 132 grown in the 2015 crop season and 44 in 2013 but still stored in the cooler where we keep samples prior to processing. The older samples include previous years' samples of lines that we opted to taste due to their agronomic and/or disease performance as of the 2015 season. We may not have tasted samples of those lines earlier but still had samples in storage. The experimental lines tested included 9 submitted to the regional performance testing program, the Peanut Variety and Quality Evaluation (PVQE) program, high-oleic backcross derivatives of the poplar 'Bailey' cultivar, two very large-seeded lines whose pods darken upon maturity, and other lines of interest. Having made the list of lines to be flavored, we pulled any remnant samples of those lines from the 2014 season, samples that had been held in cool storage.

Each sample was manually cleaned so as not to present moldy or otherwise "dirty" samples to the panel. The sample was then divided into 16 subsamples of roughly equal weight (approximately 40 g). A set of eight subsamples was distributed in a Blue M Power-O-Matic 60 laboratory oven (SPX Thermal Product Solutions, White Deer, PA) and roasted at a temperature of 160°C (320°F) for approximately 12 min or to as near an ideal color as possible (note that the seed coats are still on the seeds at the time of roasting, that there is no window into the oven, and that the seeds continue to cook in their own oil once they have heated – evaluating color is done after the fact). Duration of the roast was recorded. The seeds were air-cooled, manually

blanched (seed coats removed), and ground to paste in an Old Tyme tabletop peanut butter mill (Old Tyme Food Products, E. Long Meadow, MA). Once the paste cooled to room temperature, its color was measured using a Minolta Chroma light meter, a CIELAB L* score of 58.3 being considered ideal to elicit roasted peanut flavor. If the roast color was outside the range from 55.5 to 60.0, either too light (higher score) or too dark (lower score), then the second set of eight subsamples was roasted, adjusting the roast duration upward or downward as indicated.

A total of 207 roasted ground SMK samples from 14 graded field experiments (152 samples from 9 tests in the 2015 crop year, 55 samples from 5 tests on the 2014 crop year), representing 38 different breeding lines and 11 cultivars, were submitted to the sensory panel in the Department of Food, Bioprocessing, and Nutritional Sciences at NCSU under the direction of Dr. MaryAnne Drake. The 207 samples were assigned to 16 sensory panel sessions of 12 or 13 samples each. Two additional sessions were used at the outset of flavoring to calibrate the panelists using commercial peanut butter samples. Assignment was performed to minimize the standard error of a difference between two breeding line means. No data has been returned from the sensory panel at the time of writing this report. All of the panelists taste each roasted paste sample independently and assign a whole-number score to it for intensities of a number of sensory attributes or "flavor notes:" roast peanut, over-roast (also called "dark roast"), under-roast (also called "raw beany"), sweet, woody / hulls / skins, fruity / fermented, painty / rancid, stale / cardboard, moldy, petroleum, bitter, tongue / throat burn, astringent mouth feel, nutty aftertaste, and bitter aftertaste. All intensities were expressed on a 14-point scale from 1 (not perceptible) to 14 (most intense) for each panelist. We added the sample values averaged across panelists to the data base of NCSU flavor data and performed multiple-year analysis for those lines and cultivars tasted in 2015. The data in hand was statistically analyzed using "fruity/fermented" intensity score and the linear and quadratic effects of roast color covariates (if appropriate) for roasted peanut, sweet, and bitter attribute intensities.

Because the data from this year's sensory panels has not yet been returned, and because the results presented in last year's written report were based only upon the data that had been returned as of the time of writing, means shown in Table 1 are means from last year's panel results augmented by the data that was not available in November 2015.

There were three lines whose scores for "positive" sensory traits (roast peanut, sweet, nutty aftertaste) and the negative trait bitter fell into the "a," *i.e.*, "best," group not statistically separable from the best line tested, four of them experimental virginia-type lines: N11051oIJ, N13021oIJ, and Georgia-09B. Based on flavor alone measured in this small number of runner-type cultivars, Georgia-09B, a high-oleic single-backcross derivative of Georgia Green, should be the preferred one to use in the Virginia-Carolina area. Georgia-09B had the greatest value for sweet score and Georgia-06G, currently the most popular runner-type cultivar and therefore the peanut most commonly used in the manufacture of peanut butter, the second greatest sweet value, so if the requirement for large sweet score is relaxed so that lines with sweet scores in the "b" group are included, then there is only one additional virginia-type line in the "best" group, N13047oIJ. If the requirement is further reduced to include the "c" group, then there are 11 lines in the best group, 10 of them experimental virginia-type lines: N10078oIJC, N11051oIJ, N12007oI, N12010oI, N13010oIF, N13015oIJ, N13021oIJ, N13047oIJ, N13048+oI, and N13049oIJ. N12007oI and N12010oI are high-oleic backcross derivatives of Bailey. We will accumulate more flavor data on the Bailey derivatives that have the best yield, grade, and disease resistance profiles and plan to release the one with the best combination as "Bailey II" or "Bailey O/L." We will provide summary data on flavor of all lines flavor-tested in 2016 once the data are available.

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Table 1. Adjusted mean sensory attribute intensities (flavor “notes”) for sound mature kernel (SMK) samples from NCSU breeding lines, current virginia-type cultivars, and dominating runner-type cultivars. Means for lines tested in the field in 2014 and for Georgia Green, adjusted to a common level of environment (year and location).

Type / line	Extent of testing				Sensory attribute intensity										
	No. of		First year	Last year	Roast color	Over-roast	Under-roast	Roast peanut [‡]	Sweet [‡]	Nutty after-taste	Bitter [‡]	Astringent	Fruity / Stale / card-fer-mented board		
	Reps	Tests												Yrs	
CIELAB L*					flavor intensity units (fiu), 1=none to 14=most intense										
NCSU lines	403	41	6	2009	2014	57.11^a	1.51^{ab}	1.61^a	4.83^a	4.05^b	3.73^a	1.99^a	2.66^a	1.06^a	1.31^a
N09039oIF	30	27	6	2009	2014	57.38 ^{hi}	1.87 ^f	1.54 ^{b-f}	4.89 ^{abc}	4.04 ^{fi}	3.85 ^{a-e}	2.15 ^{g-k}	2.88 ^k	1.38 ^{g-l}	1.49 ^{h-k}
N09042oIF	20	18	5	2010	2014	57.74 ^{e-i}	1.86 ^f	1.43 ^{a-e}	5.12 ^a	4.20 ^{c-g}	3.84 ^{a-e}	2.06 ^{ej}	2.81 ^{h-k}	1.31 ^{g-l}	1.45 ^{g-k}
N10015oIEJ	6	5	2	2013	2014	58.78 ^{a-e}	1.61 ^{a-f}	1.69 ^{b-i}	4.73 ^{a-e}	3.56 ^{kl}	3.73 ^{a-h}	2.21 ^{fk}	2.75 ^{c-k}	0.67 ^{ab}	1.29 ^{aj}
N10022oIEJ	5	5	2	2013	2014	58.36 ^{a-h}	1.69 ^{b-f}	1.76 ^{b-j}	4.67 ^{b-e}	3.62 ^{kl}	3.64 ^{aj}	2.40 ^k	2.90 ^{jk}	1.04 ^{aj}	1.68 ^{kl}
N10025oIEJ	5	5	2	2013	2014	57.91 ^{a-i}	1.57 ^{a-f}	1.66 ^{b-h}	4.87 ^{a-d}	3.74 ^{h-l}	3.83 ^{a-f}	2.21 ^{fk}	2.83 ^{fk}	0.74 ^{a-d}	1.40 ^{b-k}
N10078oIJC	19	18	4	2011	2014	57.66 ^{f-i}	1.69 ^{def}	1.43 ^{a-e}	4.97 ^{abc}	4.24 ^{c-f}	3.89 ^{a-d}	1.94 ^{c-h}	2.73 ^{d-k}	1.16 ^{d-k}	1.18 ^{a-g}
N11020oIJ	14	13	4	2011	2014	59.02 ^{ab}	1.54 ^{a-f}	1.73 ^{d-i}	4.99 ^{abc}	3.96 ^{fk}	3.69 ^{a-h}	2.22 ^{jk}	2.89 ^{jk}	1.25 ^{fk}	1.64 ^{kl}
N11028oI	14	12	4	2011	2014	59.07 ^a	1.39 ^{a-e}	1.75 ^{d-i}	4.97 ^{abc}	4.10 ^{dj}	3.73 ^{a-h}	2.06 ^{dj}	2.60 ^{bj}	1.11 ^{c-j}	1.30 ^{b-j}
N11034oI	18	16	5	2010	2014	57.88 ^{d-i}	1.64 ^{def}	1.51 ^{a-f}	5.03 ^{ab}	4.15 ^{d-i}	3.88 ^{a-d}	2.01 ^{dj}	2.72 ^{c-k}	1.15 ^{d-k}	1.32 ^{b-j}
N11048oI	15	13	4	2011	2014	57.44 ^{ghi}	1.72 ^{ef}	1.57 ^{b-f}	4.91 ^{abc}	4.32 ^{a-e}	3.77 ^{a-h}	1.97 ^{d-i}	2.79 ^{g-k}	1.40 ^{g-l}	1.47 ^{g-k}
N11051oIJ	14	12	4	2011	2014	58.02 ^{c-h}	1.46 ^{a-e}	1.60 ^{b-f}	4.93 ^{abc}	4.37 ^{a-d}	3.77 ^{a-h}	1.92 ^{a-f}	2.76 ^{fk}	1.22 ^{e-k}	1.35 ^{c-j}
N11055B	8	7	2	2013	2014	58.90 ^{abc}	1.34 ^{a-d}	2.08 ^{h-l}	4.56 ^{cde}	3.76 ^{h-i}	3.55 ^{dj}	2.41 ^k	2.78 ^{fk}	1.27 ^{e-l}	1.75 ^{kl}
N11063B	5	5	2	2013	2014	57.84 ^{b-i}	1.46 ^{a-e}	2.19 ^{h-l}	4.39 ^{de}	3.83 ^{fi}	3.42 ^{fi}	2.20 ^{e-k}	2.90 ^{jk}	1.36 ^{fi}	1.74 ^{kl}
N12006oI	12	9	3	2012	2014	58.04 ^{c-h}	1.39 ^{a-e}	1.71 ^{c-i}	4.78 ^{bcd}	3.99 ^{fk}	3.65 ^{bj}	2.03 ^{dj}	2.76 ^{e-k}	1.15 ^{d-k}	1.37 ^{d-j}
N12007oI	8	8	3	2012	2014	58.33 ^{a-h}	1.48 ^{a-f}	1.77 ^{c-i}	4.94 ^{abc}	4.11 ^{c-i}	3.67 ^{a-i}	1.94 ^{a-h}	2.68 ^{aj}	1.31 ^{fi}	1.24 ^{ai}
N12008oIcLSmT17	13	3	3	2012	2014	58.27 ^{a-h}	1.43 ^{a-e}	1.73 ^{d-i}	4.70 ^{b-e}	3.95 ^{fk}	3.69 ^{a-h}	1.94 ^{c-h}	2.69 ^{bj}	1.33 ^{g-j}	1.40 ^{fk}
N12009oICLT	15	13	3	2012	2014	58.16 ^{b-h}	1.40 ^{a-e}	1.76 ^{a-j}	4.78 ^{bcd}	4.18 ^{c-h}	3.72 ^{a-h}	1.91 ^{a-f}	2.66 ^{aj}	1.39 ^{g-l}	1.35 ^{c-j}
N12010oI	12	9	3	2012	2014	58.38 ^{a-g}	1.36 ^{a-d}	1.84 ^{fi}	4.90 ^{abc}	4.25 ^{c-f}	3.67 ^{a-i}	1.85 ^{a-d}	2.60 ^{af}	1.41 ^{g-l}	1.31 ^{b-j}
N12014oI	10	9	3	2012	2014	57.52 ^{f-i}	1.55 ^{af}	1.20 ^a	4.79 ^{bcd}	4.33 ^{a-e}	3.90 ^{a-d}	1.77 ^{a-d}	2.62 ^{ah}	0.91 ^{af}	1.06 ^{a-d}
N12015oI	11	9	3	2012	2014	58.14 ^{a-h}	1.67 ^{def}	1.74 ^{c-i}	4.98 ^{abc}	4.16 ^{c-h}	3.88 ^{a-d}	2.00 ^{dj}	2.58 ^{af}	1.15 ^{d-k}	1.33 ^{b-j}
N13001oI	9	6	2	2013	2014	58.75 ^{a-e}	1.43 ^{a-e}	1.54 ^{a-f}	4.90 ^{abc}	4.09 ^{dj}	3.78 ^{a-h}	2.05 ^{dj}	2.57 ^{af}	0.97 ^{a-g}	1.27 ^{b-i}
N13003oIF	7	6	2	2013	2014	58.52 ^{a-f}	1.44 ^{a-e}	1.70 ^{b-i}	4.98 ^{abc}	4.04 ^{dj}	3.79 ^{a-g}	2.06 ^{dj}	2.60 ^{a-g}	0.70 ^{abc}	1.13 ^{a-f}
N13006oI	6	6	2	2013	2014	58.03 ^{a-h}	1.65 ^{b-f}	1.52 ^{a-f}	4.84 ^{a-d}	4.02 ^{dj}	3.78 ^{a-h}	1.93 ^{a-h}	2.62 ^{ai}	0.76 ^{a-d}	1.42 ^{c-k}
N13007oI	7	6	2	2013	2014	58.56 ^{a-f}	1.19 ^a	2.19 ^{h-l}	4.57 ^{cde}	4.00 ^{ej}	3.42 ^{gj}	2.04 ^{dj}	2.61 ^{a-h}	1.15 ^{b-k}	1.47 ^{fk}
N13008oI	6	6	2	2013	2014	58.03 ^{a-h}	1.32 ^{a-d}	1.62 ^{b-g}	4.67 ^{b-e}	4.12 ^{c-i}	3.76 ^{a-h}	1.97 ^{a-i}	2.62 ^{ai}	1.14 ^{a-k}	1.27 ^{a-i}
N13010oIF	7	6	2	2013	2014	57.85 ^{c-i}	1.54 ^{a-f}	1.68 ^{b-h}	4.84 ^{a-d}	4.21 ^{c-g}	3.69 ^{a-i}	1.81 ^{a-d}	2.51 ^{abc}	1.01 ^{a-h}	1.33 ^{b-j}
N13015oIJ	6	6	2	2013	2014	57.52 ^{d-i}	1.25 ^{abc}	1.48 ^{a-f}	4.94 ^{abc}	4.19 ^{c-h}	3.66 ^{aj}	1.65 ^a	2.45 ^a	1.26 ^{d-l}	1.06 ^{a-d}
N13019oIF	7	6	2	2013	2014	58.79 ^{a-d}	1.47 ^{a-e}	1.54 ^{a-f}	4.75 ^{bcd}	4.06 ^{dj}	3.66 ^{aj}	1.86 ^{a-e}	2.61 ^{a-g}	0.86 ^{a-f}	1.05 ^{abc}
N13021oIJ	7	6	2	2013	2014	58.47 ^{a-g}	1.37 ^{a-e}	1.52 ^{a-f}	5.06 ^{ab}	4.27 ^{af}	3.86 ^{a-e}	1.90 ^{af}	2.63 ^{ai}	0.84 ^{a-e}	1.07 ^{a-d}
N13027oIF	6	6	2	2013	2014	57.91 ^{b-h}	1.20 ^{ab}	1.48 ^{a-f}	4.61 ^{b-e}	4.16 ^{c-i}	3.54 ^{dj}	1.67 ^{ab}	2.53 ^{a-d}	0.93 ^{a-g}	0.92 ^a
N13041oIJ	6	6	2	2013	2014	58.03 ^{a-h}	1.51 ^{a-f}	1.69 ^{b-i}	4.65 ^{b-e}	3.84 ^{fi}	3.59 ^{bj}	2.09 ^{d-k}	2.74 ^{b-k}	0.95 ^{a-g}	1.27 ^{a-i}
N13042oI	6	6	2	2013	2014	58.35 ^{a-h}	1.56 ^{a-f}	1.45 ^{a-f}	5.07 ^{ab}	4.00 ^{d-k}	3.78 ^{a-h}	1.99 ^{bj}	2.53 ^{a-d}	1.02 ^{ai}	1.20 ^{a-h}
N13043oIJ	6	6	2	2013	2014	57.41 ^{fi}	1.51 ^{a-f}	1.33 ^{abc}	4.78 ^{a-d}	4.04 ^{dj}	3.97 ^{ab}	1.86 ^{a-e}	2.62 ^{ai}	0.66 ^a	1.08 ^{a-e}
N13047oIJ	6	6	2	2013	2014	58.36 ^{a-h}	1.58 ^{a-f}	1.36 ^{a-d}	5.01 ^{abc}	4.22 ^{b-g}	3.92 ^{a-d}	1.95 ^{ai}	2.48 ^{ab}	0.95 ^{a-g}	1.18 ^{a-g}
N13048+oI	6	6	2	2013	2014	58.24 ^{a-h}	1.37 ^{a-e}	1.41 ^{a-e}	4.82 ^{a-d}	4.09 ^{cj}	3.95 ^{abc}	1.93 ^{a-g}	2.53 ^{a-e}	0.76 ^{a-d}	1.23 ^{ai}
N13049oIJ	7	6	2	2013	2014	57.36 ^{f-i}	1.53 ^{a-f}	1.32 ^{ab}	4.77 ^{a-d}	4.16 ^{c-i}	3.80 ^{a-f}	1.96 ^{ai}	2.56 ^{af}	0.88 ^{a-f}	1.26 ^{ai}
N13052oIL	8	8	2	2013	2014	57.55 ^{e-i}	1.58 ^{a-f}	1.46 ^{a-f}	4.98 ^{abc}	4.00 ^{ej}	3.71 ^{a-h}	1.96 ^{bi}	2.52 ^{abc}	0.94 ^{a-g}	1.25 ^{ai}
N13054oI	6	6	2	2013	2014	57.81 ^{c-i}	1.70 ^{c-f}	1.52 ^{a-f}	4.86 ^{a-d}	3.81 ^{g-l}	3.76 ^{a-h}	2.15 ^{a-k}	2.72 ^{a-k}	1.00 ^{a-h}	1.42 ^{c-k}
N13056oISm	4	4	2	2013	2014	57.91 ^{ai}	1.48 ^{a-f}	1.69 ^{b-i}	4.54 ^{b-e}	4.10 ^{cj}	3.46 ^{ej}	1.74 ^{a-d}	2.63 ^{aj}	0.92 ^{a-g}	1.21 ^{ai}
N13057oIL	8	8	2	2013	2014	58.13 ^{a-h}	1.53 ^{a-f}	1.55 ^{a-f}	4.93 ^{abc}	3.95 ^{fk}	3.80 ^{a-f}	1.98 ^{c-i}	2.52 ^{abc}	0.92 ^{a-g}	1.16 ^{a-f}
N13058oISm	8	8	2	2013	2014	58.08 ^{a-h}	1.42 ^{a-e}	1.47 ^{a-f}	4.74 ^{bcd}	3.96 ^{fk}	3.58 ^{cj}	1.79 ^{a-d}	2.53 ^{a-e}	0.98 ^{a-g}	1.13 ^{af}
N13059oI	6	6	2	2013	2014	57.98 ^{a-h}	1.65 ^{b-f}	1.57 ^{a-f}	4.70 ^{b-e}	4.08 ^{cj}	3.69 ^{ai}	2.14 ^{e-k}	2.64 ^{aj}	1.09 ^{aj}	1.42 ^{c-k}
Mean						57.76	1.54	1.78	4.67	4.23	3.68	1.92	2.63	1.35	1.66
CV (%)						2.0	26.6	23.0	9.0	9.3	9.7	14.9	9.2	33.1	20.2

(cont'd)

‡ Fruity attribute intensity and roast color (linear and quadratic) were used as covariates for roaster peanut intensity, fruity for sweet intensity, and fruity and roast color (linear) for bitter intensity.

oI, B “oI” denotes lines with the high oleic fatty acid trait in the seed oil; “B” denotes lines with black pods.

α,β Type means followed by the same Greek letter are not different (P<0.05) by t-test.

a,b,c Type means followed by the same Roman letter are not different (P<0.05) by t-test.

ns Denotes means for traits for which the F-test of types or lines was not significant (P<0.05).

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Table 1 (cont'd). Adjusted mean sensory attribute intensities (flavor “notes”) for sound mature kernel (SMK) samples from NCSU breeding lines, current virginia-type cultivars, and dominating runner-type cultivars. Means for lines tested in the field in 2014 and for Georgia Green, adjusted to a common level of environment (year and location).

Type / line	Extent of testing				Sensory attribute intensity										
	No. of		First year	Last year	Roast color	Over-roast	Under-roast	Roast peanut [‡]	Sweet [‡]	Nutty after-taste	Bitter [‡]	Astringent	Fruity / Fermented board	Stale / card	
	Reps	Tests													Yrs
					CIELAB L* ————— flavor intensity units (fiu), 1=none to 14=most intense										
Cultivars	297	90	12	2003	2014	57.81^β	1.58^β	1.88^β	4.68^β	3.93^γ	3.62^β	2.17^β	2.86^β	1.38^β	1.48^β
Bailey	83	76	12	2003	2014	57.88 ^{d-i}	1.53 ^{b-f}	1.99 ^{h-k}	4.53 ^{de}	3.87 ^{h-k}	3.51 ^{hij}	2.17 ^{h-k}	2.88 ^k	1.50 ^{kl}	1.61 ^k
Emery	28	25	4	2011	2014	57.70 ^{f-i}	1.54 ^{b-f}	1.74 ^{e-i}	4.85 ^{bcd}	4.16 ^{d-i}	3.72 ^{a-h}	2.00 ^{d-j}	2.87 ^k	1.39 ^{h-i}	1.37 ^{e-j}
NC 7	26	25	9	2003	2014	57.65 ^{f-i}	1.56 ^{b-f}	2.18 ^{kl}	4.35 ^e	3.55 ⁱ	3.39 ^{ij}	2.36 ^k	2.85 ^k	1.42 ^{l-i}	1.58 ^{ijk}
Sugg	65	59	12	2003	2014	57.43 ^{hi}	1.53 ^{b-f}	1.97 ^{h-k}	4.53 ^{de}	3.95 ^{f-k}	3.52 ^{f-j}	2.13 ^{g-k}	2.80 ^{h-k}	1.42 ^{kl}	1.55 ^{ijk}
Sullivan	46	40	8	2007	2014	58.66 ^{a-e}	1.65 ^{def}	1.71 ^{d-i}	4.98 ^{abc}	4.00 ^{fj}	3.82 ^{a-f}	2.22 ^{kl}	2.87 ^{kl}	1.22 ^{f-k}	1.39 ^{f-j}
Wynne	49	42	7	2008	2014	57.51 ^{hi}	1.68 ^{ef}	1.71 ^{e-i}	4.82 ^{bcd}	4.04 ^{fj}	3.76 ^{a-h}	2.12 ^{l-k}	2.92 ^k	1.36 ^{g-l}	1.39 ^{f-j}
Sensory cks	76	45	13	1998	2014	57.53^β	1.42^α	1.97^β	4.67^β	4.42^α	3.57^β	1.92^α	2.69^α	1.33^β	1.48^β
F ^{lor} u ^{nne} r	17	13	8	2004	2014	58.18 ^{b-h}	1.44 ^{a-e}	2.29 ^j	4.48 ^{de}	4.01 ^{e-j}	3.33 ^j	2.20 ^{g-k}	2.76 ^{d-k}	1.44 ^{l-i}	1.85 ^l
G ^{eo} gia Gr ^{een}	41	31	9	1998	2012	57.44 ^{hi}	1.32 ^{abc}	1.95 ^{g-k}	4.48 ^{de}	4.41 ^{abc}	3.39 ^{ij}	1.89 ^{a-e}	2.70 ^{c-j}	1.59 ^l	1.51 ^{ijk}
G ^{eo} ria-06G	10	8	2	2013	2014	57.90 ^{c-i}	1.40 ^{a-e}	2.17 ^{kl}	4.75 ^{bcd}	4.60 ^{ab}	3.59 ^{c-j}	1.87 ^{a-e}	2.73 ^{c-k}	1.13 ^{d-j}	1.50 ^{g-k}
G ^{eo} ria-09B	8	6	2	2013	2014	56.57 ⁱ	1.54 ^{a-f}	1.45 ^{a-f}	4.98 ^{abc}	4.65 ^a	3.98 ^a	1.72 ^{abc}	2.57 ^{a-f}	1.14 ^{b-k}	1.05 ^{ab}
Mean						57.76	1.54	1.78	4.67	4.23	3.68	1.92	2.63	1.35	1.66
CV (%)						2.0	26.6	23.0	9.0	9.3	9.7	14.9	9.2	33.1	20.2

‡ Fruity attribute intensity and roast color (linear and quadratic) were used as covariates for roaster peanut intensity, fruity for sweet intensity, and fruity and roast color (linear) for bitter intensity.

ol, B “ol” denotes lines with the high oleic fatty acid trait in the seed oil; “B” denotes lines with black pods.

α,β Type means followed by the same Greek letter are not different (P<0.05) by t=test.

a,b,c Type means followed by the same Roman letter are not different (P<0.05) by t=test.

ns Denotes means for traits for which the F-test of types or lines was not significant (P<0.05).

IMPACT STATEMENT

This program provides the sensory data that is included among the criteria considered when a cultivar release is contemplated. The result is the release of lines with superior flavor profiles, or at least not diminished profiles. It is not possible to ascribe improved price or sales to improvement of flavor, nor is it possible to assert that the release of cultivars with superior flavor results in greater market share for virginia-type peanuts, but processors of peanuts insist that flavor is their overriding concern. As long as we can obtain funds to continue the program, we will do so.