Research Note

FRUIT DEFECTS, SIZE DISTRIBUTION AND SENSORY EVALUATION OF FOUR COMMERCIAL TOMATO CULTIVARS[1]

During the 1986-87 growing season, two of the largest fresh market tomato growers in Puerto Rico planted on a commercial scale different lines of the BHN series for evaluation under local conditions. Their intended use was mainly for the export market. One of the best performing lines planted (in terms of marketable yield) was BHN-66. In addition, one of the two growers planted cultivars Duke and Sunny, previously used for the export market, plus a promising one known as Bonanza.

Among many factors determining success in the commercial production of fresh market tomato, or any other crop, is the plant itself. Therefore, the search for new or improved cultivars with outstanding characteristics, such as high yield, high quality, resistance to insects and diseases, adaptation to local conditions, is never ending.[2,3,4] The objective of this experiment was to evaluate some fruit quality characteristics of Duke, Sunny, Bonanza and BHN-66 cultivars.

Samples were collected during the first and second harvests. From each cultivar, four samples per harvest were gathered, a total of 50 fruits each. Fruit defects and size distribution were determined according to U.S. Department of Agriculture specifications.[5,6,7] If a fruit showed more than one defect, it was discarded only on the basis of the more severe one. This evaluation was made when fruits reached the mature green stage.

The sample used for the sensory evaluation corresponded to fruits of the first harvest, classified in the packing line as U.S. No. 1 for grade and extra large (5x6) for size. These fruits were stored for approximately 2 weeks at 20° C, until they reached the firm ripe stage. At this time they were sensory evaluated by a 9- to 12-member taste panel. Evaluation was based on a 5-point descriptive scale for appearance, flavor, sweetness and acidity. Off-flavor was rated on a scale ranging from 4 to 1 (none to very intense).[8]

Table 1 presents percentage of culled or non-marketable tomatoes. No significant difference was observed in this respect among cultivars. The most frequently observed defects in all fruits evaluated were scars, cat faces, odd shapes and cuts, with an average among cultivars of 5.50%, 2.44%, 2.19% and 2.06%, respectively.

[1]Manuscript submitted to Editorial Board 9 January 1990.

[2]Maynard, D., 1985. Selection of vegetable varieties for use in Florida. Univ. Fla., IFAS, Vegetarian Nwsl. (85-5).

[3]Price, H. C. and B. C. Zandstra, 1987. Cultivar testing: public point of view. *HortScience* 22: 1211-212.

[4]Thompson, H. C. and W. C. Kelly, 1957. Vegetable crops. McGraw-Hill Co.

[5]United States Dept. of Agriculture, 1976. United States standards for grades of fresh tomatoes. USDA Agric. Mktg. Serv., Fruit and Vegetable Div., Washington, D. C.

[6]United States Dept. of Agriculture, 1983. Market inspection instruction for fresh tomatoes. USDA Agric. Mktg. Serv., Fruit and Vegetable Div., Washington, D. C.

[7]United States Dept. of Agriculture, 1985. Shipping point inspection instructions for fresh tomatoes. USDA Agric. Mktg. Serv. Fruit and Vegetable Div., Washington, D. C.

[8]Larmond, E. 1977. Laboratory methods for sensory evaluation of food. Can. Dep. Agric. Publ. 1637. Ottawa, Canada.

TABLE 1.—*Percentage of fresh market tomato fruits considered as cull or non-marketable, because of defects, from samples collected during the 1986-87 growing season*

Cultivars	Percent of fruits with defects[1]														
	Sunscald	Worm damage	Insect damage	Shoulder bruises	Bruises	Scars	Growth cracks	Internal browing	Misshapen	Puffy	Wall discoloration	Cat faces	Cuts	Skin checks	Total
Duke	—	1.25	—	—	—	7.25	1.50	—	2.00	1.50	1.25	3.50	1.00	0.25	19.50 a[2]
Sunny	—	0.75	—	0.25	0.25	5.00	0.50	1.25	1.00	0.25	0.50	2.50	4.00	1.25	17.75 a
Bonanza	—	0.50	0.75	1.00	0.75	6.00	1.00	4.50	2.00	0.75	2.00	1.00	1.75	—	22.00 a
BHN-66	0.50	—	—	1.50	1.75	3.75	1.50	0.50	3.75	—	—	2.75	1.50	0.50	18.00 a
Average	0.13	0.75	0.19	0.69	0.69	5.50	1.13	1.56	2.19	0.63	0.94	2.44	2.06	0.50	19.31

[1]If a fruit showed more than one defect, only the more severe one was taken in account in order to discard it as cull or non-marketable. Values are the average of the first and the second harvests.

[2]Values in column followed by the same letter do not differ statistically (P= 0.05) according to Duncan's multiple range test.

TABLE 2.—*Fresh market tomato fruit size distribution of samples collected during the 1986-87 growing season*

Cultivar	Size distribution[1]				
	Small (7x7)	Medium (6x7)	Large (6x6)	Extra Large (5x6 and 5x5)	Maximum large (4x5 and larger)
	%	%	%	%	%
Duke	0.50	15.25	61.25	23.00 b[2]	—
Sunny	—	35.00	54.50	10.50 c	—
Bonanza	—	7.50	49.25	41.50 a	1.75
BHN-66	—	8.50	71.50	20.00 bc	—

[1]Minimum and maximum diameters corresponding to each size designation: small = 54-58 mm; medium = 58-64 mm; large = 64-73 mm; extra large = 73-88 mm; and maximum large = 88 mm minimum. Size distribution correspond to the average of the values obtained in the first and the second harvests.

[2]Values in columns followed by the same letter do not differ statistically (P = 0.05) according to Duncan's multiple range test.

Table 2 presents data on the average of the size distribution of all samples from the first and second harvests. The lowest percentage of fruits large and extra large corresponded to Sunny (65.00), which differed significantly at the 5% level from Bonanza (92.50), BHN-66 (91.50) and Duke (84.25). These three cultivars did not differ significantly among themselves. Bonanza had the highest percentage of extra large fruits (41.50); Sunny the lowest (10.50).

Table 3 presents the results of the sensory evaluation of sliced tomato samples from the first harvest. No significant differences in appearance, aroma, sweetness, acidity nor off-flavors were observed. All were found acceptable in appearance, with values above 4.00. Aroma was rated from "moderate" to "some aroma." Evaluation of sweetness ranged from "some sweetness" to "little sweetness." Regarding acidity, panelists rated the tomatoes "moderate" to "some acidity." No off-flavors were reported.

In conclusion, no significant difference was observed among cultivars for total per-

TABLE 3.—*Sensory evaluation of fresh market sliced tomato fruits corresponding to the first harvest of the 1986-87 growing season*

Cultivar	Sensory evaluation mean values[1]				
	Appearance	Aroma	Sweetness	Acidity	Off-flavors
Duke	4.45 a	3.53 a	2.64 a	4.00 a	3.90 a
Sunny	4.39 a	4.09 a	2.70 a	4.20 a	3.90 a
Bonanza	4.16 a	3.57 a	2.84 a	4.08 a	3.83 a
BHN-66	4.54 a	3.81 a	2.46 a	4.18 a	4.00 a

[1]Appearance - 5 = like very much; 1 = do not like.
Aroma - 5 = strong aroma; 1 = no aroma.
Sweetness - 5 = very sweet; 1 = not sweet.
Acidity - 5 = not acid; 1 = strong acidity.
Off-flavors - 4 = none; 1 = very intense.

[2]Values in columns followed by the same letter do not differ statistically (P = 0.05) according to Duncan's multiple range test.

centage of fruit discarded because of defects or sensory evaluation. In a local or export market like ours, in which most of the demand is for large and extra large fruits, all cultivar fruit samples collected during the 1986-87 season could be considered as acceptable, except for Sunny, which showed the lowest values for fruit size.

Guillermo J. Fornaris
Assistant Researcher
Department of Horticulture

Rubén Guadalupe
Horticulturist
Department of Horticulture
Isabel Beauchamp de Caloni
Food Technologist
Laboratory of Food Technology
Carmen Chao de Báez
Associate Statistician
Statistics Section