Research Note

*LONG TERM EVALUATION OF GUAVA (*PSIDIUM GUAJAVA*) GENOTYPES ON THE SOUTH COAST OF PUERTO RICO*[1]

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Soils from the arid coastal plains of southern Puerto Rico are among the most fertile of the Island. Most of these fertile soils used to be devoted to sugar cane. As sugar cane production became unprofitable, many farms fell into disuse. Some of those farms are now mostly devoted to the production of vegetables, plantains and bananas, mangos, avocados and other fruits (Department of Agriculture of Puerto Rico, 2009-10). Guava, specifically for processing, is an easy-to-grow, low maintenance, potentially profitable fruit crop for this area (Vélez-Colón et al., 2003). This fruit has been studied by the Agricultural Experiment Station (AES) since at least the 1970's (Dhalival and Serapión, 1981; López-García and Pérez-Pérez, 1977; Rodríguez and Iguina, 1971).

In Juana Díaz, Puerto Rico, AES established an experimental guava orchard in a San Antón soil (fine-loamy, mixed, superactive, isohyperthermic Cumulic Haplustolls) (USDA, 1979), a typical soil series of this area. The purpose of our study was to evaluate three production parameters of 14 guava clones suitable for processing.

In 1997, fourteen guava clones were grafted onto an appropriate rootstock. The rootstock was a selection from Aibonito, Puerto Rico, chosen for its vigor and the reddish color of its leaves (possibly seedlings of cultivar 'Red Malaysian'), which made it easier to identify undesirable shoots. The selected clones, all previously introduced and growing at the AES Juana Díaz at the time, were 57-1-28, 57-4-30, R-258, 57-10-137, 57-7-19, 57-6-71, M-184, 57-2-95, R-264, G-864, 57-8-163, Q-241, G-447, and 57-1-42. These clones were chosen mostly on the basis of previous organoleptic tests (Vélez-Colón et al., 1994). They were planted in the field 11 February 1998. Three replications (three blocks) were used, each containing four trees of every clone, planted in a single row in randomized complete blocks. Planting distances were 7 m apart within the row with 5 m between rows. The orchard was pruned twice, June 2000 and December 2002. Originally, harvest started in December 1998, and went on almost continuously (Vélez-Colón et al., 2003). This report begins with January 2001.

All selected clones have proven to be fast-growing and resistant to disease and other environmental stresses. It is presumed that the high fertility of the soil and the constant supply of water through drip irrigation have contributed to this growth. Pesticide use has been negligible, with the exception of herbicides.

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The yearly total weight (total yield) per selection, yearly total number of fruits per selection, and average fruit weight per selection were analyzed by using ANOVA. Differences among means were assessed by using LSD tests with a significance level of 0.05. All statistical analyses were done by using SAS 9.1 (SAS Institute, Cary, NC).

In 2001, selection 57-8-163 showed the highest yield (Table 1). In 2002 selection 57-6-71 had the highest yield. This finding alone may suggest either that there are significant environmental differences from year to year affecting production, or that some selections are erratic or take longer to initiate production.

In 2003, selections 57-10-137 and 57-8-163 were the highest producers (significantly above G-864). The lower production during this year, compared to that of the previous year is probably related to the pruning of December 2002. In 2004, selection 57-6-71 was the highest producer. In 2005, selections 57-8-163 and 57-10-137 were the highest producers. In 2006, it was selection 57-8-163. In 2007, it was selections 57-2-95, 57-8-163, 57-10-137 and 57-6-71. Finally, in 2008, highest selections were 57-7-19, 57-10-137, 57-2-95 and 57-8-163 (Table 1).

Table 1 shows the differences in yield among selections and among years. Selection 57-8-163 showed the highest yields, whereas selection G-864 showed the lowest. Selections 57-7-19, 57-10-137, 57-6-71 and 57-2-95, although erratic, are also good producers.

As for total number of fruits (Table 2), in 2001 selections 57-8-163 and 57-10-137 produced the highest number of fruits. In 2002, selections 57-6-71 and 57-8-163 produced the highest number of fruits; in 2003, selections 57-10-137, 57-8-163 and 57-7-19. In 2004, selections 57-10-137 and 57-8-163 produced the highest numbers of fruits; in 2005, selections 57-8-163, 57-10-137, 57-7-19, and 57-6-71. In 2006, selections 57-8-163, 57-7-19, 57-10-137, 57-6-71, and 157-2-95 were the highest producers. In 2007, selections 57-7-19, 57-8-163, 57-10-137, 57-2-95, 57-6-71, M-184, and 57-4-30 produced the highest. Finally, in 2008 selections 57-7-19, 57-10-137, 57-2-95, and 57-8-163 produced the highest number of fruits.

Table 2 shows the differences among selections and the differences among years. A similar pattern for total yield is evident: Selection 57-8-163 appears generally to have produced significantly more fruits than the other selections, followed by selections 57-7-19, 57-10-137, 57-6-71, and 57-2-95, whereas selection G-864 appears generally to have produced significantly fewer fruits than the other selections.

As to average weight (Table 3) there is a different panorama. Some of the selections tended to produce heavy fruits, whereas others produced light fruits. In 2001, selections Q-241, G-447, 57-1-28, R-264, M-184, 57-4-30 and G-864 produced the highest averages (heaviest fruits). In 2002, selections G-447, Q-241, and G-864 produced the highest averages. In 2003, it was selection G-447. In 2004, selections G-864, Q-241 and G-447 had the highest averages. In 2005, selection Q-241 produced the highest average; in 2006, selections R-264 and G-864. In 2007, selections G-864 and Q-241 produced the most. Finally, in 2008 selections Q-241, 57-4-30 and R-264 had the highest average production.

Selections such as Q-241, G-447 and G-864 showed a marked tendency to produce heavy fruits, even though these selections did not distinguish themselves as heavy producers, either as related to total yield or to number of fruits; in fact, at least G-864 distinguished itself as a poor producer. On the other hand, some selections that did distinguish themselves as heavy producers, such as 57-8-163, or as good but erratic producers, such as 57-6-71, 57-7-19 and 57-10-137, showed a tendency to produce light fruits. Average fruit weight appears to have increased during 2003, a year of low production.

Since these are selections suitable for processing, it is presumed that farmers (and processors) will be interested in total yield. Thus, one would expect that selections such as 57-8-163, 57-6-71 and 57-10-137 would be preferred for this purpose. Heavy-weighted selections such as Q-241, G-447 and G-864 might be adequate for homes and families, as their fruits may be showy, although not particularly sweet.

TABLE 1. *Total yield (kg) per year for the fourteen guava selections. In a given year, means followed by the same letter do not differ significantly according to the LSD test (P > 0.05). [EW = Estimated weight].*

	Year							
	2001	2002	2003	2004	2005	2006	2007	2008
Selection	EW	EW	EW	EW	EW	EW	EW	EW
Q-241	271 ab	176 cdef	64 ab	210 bc	126 d	248 bc	215 abc	86 fg
G-447	267 ab	214 bcde	58 ab	328 ab	271 abc	367 ab	268 abc	158 cd
57-7-19	222 bcd	239 bcd	108 ab	259 ab	284 ab	336 ab	265 abc	247 a
57-1-42	237 abc	246 bcd	59 ab	240 ab	193 bcd	269 abc	212 bc	97 efg
57-10-137	239 abc	233 bcd	127 a	297 ab	346 a	369 ab	309 ab	217 ab
57-6-71	222 bcd	346 a	50 ab	345 a	270 abc	351 ab	302 ab	148 cde
G-864	162 d	110 f	26 b	117 c	133 cd	163 c	146 c	69 g
M-184	261 ab	163 def	57 ab	233 abc	174 bcd	259 bc	252 abc	155 cd
57-4-30	272 ab	258 bc	63 ab	303 ab	166 bcd	247 bc	273 abc	119 defg
57-8-163	306 a	284 ab	115 a	311 ab	361 a	435 a	337 ab	195 abc
57-2-95	177 cd	138 ef	82 ab	231 abc	236 abcd	300 abc	344 a	201 abc
R-258	243 abc	224 bcd	83 ab	225 bc	239 abcd	291 abc	262 abc	122 def
57-1-28	262 ab	240 bcd	65 ab	302 ab	183 bcd	307 abc	236 abc	131 def
R-264	278 ab	208 bcde	77 ab	283 ab	237 abcd	369 ab	226 abc	165 bcd

Table 2. *Total number of fruit per year for the fourteen guava selections. In a given year, means followed by the same letter do not differ significantly according to the LSD test (P > 0.05). [EN = Estimated number].*

	Year							
	2001	2002	2003	2004	2005	2006	2007	2008
Selection	EN	EN	EN	EN	EN	EN	EN	EN
Q-241	2,610 bc	1,825 cd	531 ab	2,055 de	1,475 e	3,142 de	2,879 de	1,004 g
G-447	2,571 bc	2,245 cd	634 ab	3,498 abcd	3,870 bcde	4,928 bcd	3,754 bcde	2,060 cdef
57-7-19	2,776 b	3,315 bc	1,451 a	4,154 abc	5,695 abc	6,802 ab	6,134 a	4,167 a
57-1-42	2,901 b	3,197 bc	606 ab	2,830 bcd	2,740 de	3,954 de	3,056 de	1,239 fg
57-10-137	2,998 ab	3,098 bc	1,599 a	4,756 a	5,916 ab	6,466 abc	5,952 ab	3,158 b
57-6-71	2,834 b	5,143 a	578 ab	4,470 ab	4,114 abcd	5,418 abcd	4,912 abcd	2,154 cde
G-864	1,714 d	1,233 d	191 b	1,088 e	1,583 e	1,867 e	1,722 e	840 g
M-184	2,699 bc	1,973 cd	541 ab	2,728 cde	2,613 de	3,500 de	4,203 abcd	1,942 ef
57-4-30	2,872 b	3,314 bc	606 ab	3,446 abcd	2,336 de	3,397 de	4,033 abcd	1,418 efg
57-8-163	3,778 a	4,087 ab	1,511 a	4,694 a	6,537 a	7,412 a	6,119 a	2,855 bcd
57-2-95	1,977 cd	1,764 cd	880 ab	2,926 bcd	3,555 bcde	5,096 abcd	5,573 abc	2,920 bc
R-258	2,762 bc	2,885 bc	831 ab	2,529 cde	3,214 cde	4,221 cde	3,662 cde	1,648 efg
57-1-28	2,673 bc	2,840 bc	626 ab	3,507 abcd	2,593 de	4,259 cde	3,422 cde	1,653 efg
R-264	2,885 b	2,420 cd	798 ab	3,169 abcd	3,354 cde	4,347 bcd	3,231 de	1,996 def

TABLE 3. *Average weight per fruit (g) per year for the fourteen guava selections. In a given year, means followed by the same letter do not differ significantly according to the LSD test (P > 0.05). [EW = Estimated weight].*

	Year							
	2001	2002	2003	2004	2005	2006	2007	2008
Selection	EW	EW	EW	EW	EW	EW	EW	EW
Q-241	104.71 a	95.76 ab	119.27 abc	102.77 ab	85.98 a	80.22 ab	76.41 ab	85.10 a
G-447	104.25 a	96.08 a	140.92 a	94.08 abc	71.87 abc	74.05 abc	71.50 bc	77.37 abc
57-7-19	79.93 d	72.50 cd	80.17 c	63.31 f	49.51 d	49.63 e	43.85 e	59.81 d
57-1-42	81.83 cd	77.54 abcd	106.40 abc	85.68 cd	71.84 abc	68.01 bcd	69.21 bc	78.57 abc
57-10-137	79.78 d	75.90 bcd	82.23 c	63.40 f	59.31 cd	57.12 de	52.02 de	69.86 bcd
57-6-71	80.09 d	68.89 d	110.68 abc	78.61 de	65.44 cd	64.19 cd	61.78 cd	68. 90 cd
G-864	94.58 abc	89.75 abc	130.88 ab	107.67 a	83.24 ab	85.76 a	85.09 a	82.10 ab
M-184	96.54 ab	88.20 abcd	105.48 abc	85.34 cd	66.86 bcd	74.58 abc	61.35 cd	81.14 abc
57-4-30	95.00 abc	81.43 abcd	111.08 abc	87.37 cd	72.04 abc	73.13 bc	67.80 bc	84.45 a
57-8-163	81.16 d	69.73 cd	84.66 bc	67.27 ef	57.20 cd	58.71 de	55.10 de	68.67 cd
57-2-95	90.38 bcd	77.95 abcd	99.70 abc	78.80 de	68.68 abc	59.33 de	61.98 cd	68.90 cd
R-258	88.79 bcd	80.32 abcd	106.08 abc	89.13 bcd	74.27 abc	67.79 cd	71.65 bc	74.23 abc
57-1-28	97.97 ab	84.62 abcd	115.07 abc	87.58 cd	73.12 abc	72.64 bc	67.53 bc	79.31 abc
R-264	97.20 ab	86.87 abcd	113.61 abc	89.58 bcd	72.01 abc	85.81 a	69.85 bc	82.83 a

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