

AVOCADO CLONAL ROOTSTOCK PRODUCTION TRIAL PROGRESS REPORT

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There has been extensive research conducted by the University of California to identify rootstocks which are resistant to *Phytophthora cinnamomi*, but little evaluation of the horticultural attributes of these selections has been made. A project was established in 1986 with the primary goal to assess the horticultural attributes of promising clonal rootstocks. The results from this study will help to provide guidelines for distinguishing between avocado clonal rootstocks beyond the criteria of disease resistance.

This trial was planted in 1986 in a *Phytophthora* root rot free field. In this trial we are evaluating the performance of 'Hass' variety on the G755A, G755B, G755C, Toro Canyon, Borchard, Duke 7, D9, Thomas, and G1033 clonal rootstocks. We also have clonally propagated Topa Topa included in the trial. Due to tree availability at the time of planting, the Thomas and G1033 trees were planted in 1987 and are therefore one year younger.

As we reported previously, the Borchard and Duke 7 rootstocks continue to be the highest producing rootstocks in the trial (Table 1). One should note, however, that the Borchard rootstock is known to be susceptible to *Phytophthora* root rot. The Toro Canyon, D9 and Topa Topa rootstocks are producing comparable yields whereas the three G755 rootstocks remain less productive. It is noteworthy that both the Thomas and G1033 rootstocks, although planted one year later than the remaining portion of the trial, have yielded comparable amounts of fruit to the G755 trees.

Table 2 presents the average fruit size data from the trial. Although we have noted significant differences in average fruit size each year there has been no consistent trends in fruit size that can be associated with a particular rootstock.

A component of yield not often considered is year efficiency, that is the amount of fruit that is produced for a given volume of tree. Often times, examining data on this basis can provide a different interpretation of productivity trends. Table 3 illustrates the changes in tree size (as indicated by canopy volume) for the 8 rootstocks planted in 1986. Note that the Borchard rootstock since Year 6.5 has produced the largest tree. The G755C trees have consistently produced a smaller tree.

Yield efficiency is presented in Table 4. The yield efficiency for 1993 was calculated by dividing the 1993 yield (Year 7) by the 6.5 year canopy volume. The 1994 yield efficiency was calculated by dividing the 1994 yield (Year 8) by the 7.5 year canopy volume. The 1995 yield efficiency was calculated by dividing the 1995 yield (Year 9) by

the 8.5 year canopy volume. By doing this calculation, a different view of tree productivity is obtained. Years 5, 7, and 9 can be considered "on" years. Note that the yield efficiency in Years 5 and 7 are comparable. Although Year 9 was also an "on" year the yield efficiency is much lower. This could be due to a number of reasons. The first is that 1995 although a good crop year did not match 1993 in terms of productivity probably related to environmental conditions during bloom and fruit growth. The second probable reason can be related to tree size. During the last 2 years the trees have started to crowd and have begun to take on the characteristics of an overgrown orchard. The reduction in yield efficiency could be related to the fact, therefore, that although the tree is structurally larger due to crowding and shading of fruit-bearing wood there is less bearing capacity available.

The planting which was established in 1993 includes the rootstocks: D9, Hibbard (Pauma), UC2011, Queretero, Dusa, and CR1-80, Duke 7 and Thomas. Also included within the planting is the BL-122 on Duke 7. The trial established well, however, during 1995 several trees turned extremely chlorotic and showed poor growth. We were able to link this to the irrigation practices applied to the block. It appears that this has been corrected and we look forward to good tree recovery. We harvested the first fruit from the trial in April 1995 and anticipate having a small harvest in April 1996.

Table 1. Yield (kg/tree) for 'Hass' avocado on selected clonal rootstocks. Trees are harvested in April of each year.

Rootstock	Years from Planting									Total
	2	3	4	5	6	7	8	9		
<i>Planted 1986</i>										
G755A	0.3 b	1.5 c	2.8 d	30.6 b	17.5 ab	83.8 bc	16.9 ab	33.0 c	186.4 d	
G755B	0.0 b	1.7 c	1.1 d	16.7 b	23.1 a	68.9 cd	23.6 a	20.8 c	157.9 de	
G755C	0.0 b	0.8 c	0.9 d	24.6 b	5.6 bc	49.6 d	16.5 ab	25.7 c	125.1 e	
Duke 7	0.6 b	6.7 ab	29.7 a	66.5 a	11.8 abc	129.4 a	12.0 ab	118.9 a	375.8 ab	
Borchard	0.4 b	3.8 bc	20.8 b	68.4 a	23.2 a	127.7 a	23.4 a	143.4 a	410.9 a	
D9	1.1 b	1.3 c	9.3 cd	57.9 a	10.0 abc	110.3 ab	12.6 ab	70.2 b	272.7 c	
Toro Canyon	3.8 a	2.9 c	17.0 bc	61.1 a	4.0 bc	115.1 a	0.4 b	133.0 a	338.1 b	
Topa Topa	0.2 b	7.5 a	17.7 bc	64.0 a	0.5 c	112.4 a	0.5 b	126.2 a	328.6 b	
<i>Significance^z</i>	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>	<i>0.05</i>	<i>0.05</i>	<i>0.05</i>	
<i>Planted 1987</i>										
Thomas	0.8	3.0	35.2	16.1	71.7	15.1	83.03	-	224.93	
G1033	0.2	4.1	19.3	17.1	58.4	20.0	79.97	-	199.07	
<i>Significance</i>	<i>NS</i>	<i>NS</i>	<i>0.01</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	

^z NS = not significant. Mean separation using LSD.

Table 2. Average fruit size (g) for 'Hass' avocado on selected clonal rootstocks. Trees harvested in April of each year.

Rootstock	Years from Planting								
	2	3	4	5	6	7	8	9	
<i>Planted 1986</i>									
G755A	254	253	218	171 a	164 c	223 ab	265 b	207 b	
G755B	-	232	214	144 abc	160 c	220 ab	259 b	212 b	
G755C	-	249	240	159 ab	153 c	205 c	245 b	220 ab	
Duke 7	276	275	263	151 ab	217 ab	219 ab	301 a	223 ab	
Borchard	250	271	288	156 ab	209 ab	225 a	261 b	216 b	
D9	267	288	281	171 a	220 ab	220 ab	264 b	235 a	
Toro Canyon	293	276	265	121 c	194 b	211 bc	310 a	188 c	
Topa Topa	263	262	263	138 bc	230 a	212 abc	278 a	208 b	
<i>Significance^z</i>	NS	NS	NS	0.01	0.01	0.05	0.05	0.05	
<i>Planted 1987</i>									
Thomas	250	252	166	168	213	269	214	-	
G1033	250	290	170	157	223	232	205	-	
<i>Significance</i>	NS	NS	NS	NS	NS	NS	NS	NS	

^z NS = not significant. Mean separation using LSD.

Table 3. Canopy volume (m³) of 'Hass' trees on selected clonal rootstocks. Trees are harvested in April of each year.

Rootstock	Years from Planting					
	3.5	4.5	5.5	6.5	7.5	8.5
<i>Planted 1986</i>						
G755A	-	25.9	-	56.2 ab	59.0 bc	80.4 bc
G755B	-	28.0	-	51.4 bc	61.3 ab	77.9 bcd
G755C	-	32.3	-	44.7 bc	51.3 c	67.0 d
Duke 7	-	28.6	-	53.2 abc	61.9 ab	85.7 ab
Borchard	-	30.9	-	63.2 a	69.7 a	93.9 a
D9	-	26.2	-	49.1 bc	56.8 bc	74.5 cd
Toro Canyon	-	29.4	-	43.9 c	59.0 bc	76.1 bcd
Topa Topa	-	29.1	-	52.5 abc	62.2 ab	77.6 bcd
<i>Significance^z</i>	-	<i>NS</i>		<i>0.01</i>	<i>0.05</i>	<i>0.05</i>
<i>Planted 1987</i>						
Thomas	28.5	-	39.67	49.8	65.9	
G1033	24.1	-	35.92	44.4	54.4	
<i>Significance</i>	<i>NS</i>		<i>NS</i>	<i>NS</i>	<i>0.05</i>	

^z NS = not significant. Mean separation using LSD.

Table 4. Yield efficiency (kg per m³ canopy volume) of 'Hass' trees on selected clonal rootstocks. Trees are harvested in April of each year.

Rootstock	Years from Planting					
	4	5	6	7	8	9
<i>Planted 1986</i>						
G755A	0.11 d	1.57 ab	0.32 ab	1.56 b	0.36 a	0.39 d
G755B	0.05 d	0.64 b	0.41 a	1.37 b	0.41 a	0.27 d
G755C	0.03 d	0.79 b	0.11 bcd	1.08 b	0.38 a	0.38 d
Duke 7	1.10 a	2.55 a	0.22 abcd	2.49 a	0.17 ab	1.42 b
Borchard	0.67 bc	2.47 a	0.28 abc	2.24 a	0.28 ab	1.62 ab
D9	0.35 cd	2.38 a	0.19 abcd	2.38 a	0.17 ab	0.96 c
Toro Canyon	0.60 bc	2.19 a	0.10 cd	2.66 a	0.01 b	1.78 a
Topa Topa	0.72 b	2.88 a	0.01 d	2.34 a	0.01 b	1.73 ab
<i>Significance^z</i>	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>	<i>0.05</i>	<i>0.05</i>
<i>Planted 1987</i>						
Thomas	1.26 a	0.41	2.00	0.48	1.26	
G1033	0.75 b	0.48	1.68	0.32	1.47	
<i>Significance</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>	

^z NS = not significant. Mean separation using LSD.

