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Field Evaluation of 'Hass' Avocado Grown on Duke 7', G6 and G755C Rootstocks

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Abstract. **'Hass' avocado trees on Duke 7, G6 and G755C rootstocks were planted in 1987. In 1989, trees on all three rootstocks bore a first small crop. In 1990, yields averaged 33, 15 and 6 kg per tree for 'Hass' on Duke 7, G6 and G755C respectively. This ranking was reversed for trunk circumference measurements. There was no difference in quality of the fruit grown on the different rootstocks. However, the shape of 'Hass' fruit grown on Duke 7 was significantly rounder than 'Hass' on G6 and G755C, which were more pear shaped.**

The commercial use of clonal rootstocks is relatively new in avocado growing (Whiley *et al.,* 1990). In South Africa, the devastation caused by *Phytophthora cinnamomi* in avocado orchards led to the importation of several new rootstocks from California including Duke 7, G6 and Martin Grande selections (collectively G755A, G755B, G755C). While considerable advances have been made with the development of *Phytophthora* root rot tolerant rootstocks only little information regarding the productivity and fruit quality of important cultivars grafted on these clonal rootstocks is available (Whiley *et al.,* 1990).

Ben-Ya'acov (1987) has shown that different avocado rootstocks can perform considerably differently with the same scion-clone grafted on them. Similar observations concerning the performance of 'Hass' as a scion on some clonal rootstocks have been made by Bergh *et al.* (1988) and Whiley *et al.* (1990). However, it appears that commercial 'Hass' plantings on different clonal rootstocks are presently planted in several avocado growing countries without having sufficient information available.

In this paper, recently available data on the horticultural performance of 'Hass' grafted on three clonal rootstocks are reported.

Materials and Methods

A 'Hass' orchard (approx. 3 ha) was established at Westfalia Estate (North-Eastern Transvaal Lowveld, latitude 24°S) at a spacing of 5.0 by 5.0 m using equal numbers of Duke 7, G6 and G755C rootstocks. Trees, all equal in size, age and scion, were planted in March, 1987, in well-prepared soil. The soil type is a fine-loamy, mixed paleudult (USDA, 1975) with a clay content of approximately 40%. The trees are irrigated by mini-sprinkler using tensiometers, i.e. replenishment of soil moisture to field capacity when soil moisture tension reaches 50 to 60 kPa.

In July, 1989, and 1990, tree health, trunk circumference and yield were recorded for 37 trees on each rootstock. Tree health was rated according to a disease index of 0 (healthy) to 10 (dead) as described by Darvas *et al.* (1984). For tree size determination, trunk circumference was measured 20 cm above ground level. Fruit quality was evaluated after four weeks of cold storage at 5C using 70 fruit (weight range 266-305 g) grown on each of the three rootstocks. In 1990, pericarp and seed weight as well as fruit length and diameter were recorded for 50 fruit (weight range 266-305 g) grown on each of the three rootstocks.

Results

In 1989 and 1990, tree health of all trees in this trial was rated zero, i.e., they looked perfectly healthy. In 1 989 and 1990, trunk circumference did not differ between 'Hass' on Duke 7 and G6. 'Hass' on G755C, however, had a significantly larger trunk circumference and appeared to be the fastest growing scion-rootstock combination in this trial (Table 1). In 1989, trees on all three rootstocks bore a first small crop. In 1990, the yield ranking was 'Hass' on Duke 7 > G6 > G755C - a ranking reversed for trunk circumference (Table 1). In the postharvest evaluation, 'Hass' fruit grown on all three rootstocks reached the eating ripe stage four days after removal from cold storage; all fruit were of excellent quality. Fruit shape was, however, influenced by the root-stock. 'Hass' fruit grown on Duke 7 were significantly shorter and had a significantly smaller length/diameter ratio than fruit grown on G6 and G755C (Table 2). In other words, the shape of 'Hass' fruit grown on Duke 7 was rounder than 'Hass' on G6 and G755C, which were more pear-shaped. Seed weight, expressed as percent of total fruit weight, was higher in fruit grown on Duke 7 when compared to fruit grown on G6 and G755C (Table 2).

Discussion

The results of this research indicate clearly that rootstocks have a major influence on the precocious bearing of 'Hass' trees. Of the three clonal root-stocks evaluated in this experiment, the well known Duke 7 out-performed the two new rootstocks tested, G6 and G755C. This is in agreement with data obtained from a rootstock trial at South Coast Field Station (California), where 'Hass' on Duke 7 was also the most productive rootstock-scion combination; 'Hass' on G755C had the lowest yield of all the rootstocks compared (Whiley *et al.,* 1990). The horticultural value of the Martin Grande range of rootstocks (G755A, G755B, G755C) as well as G6 for 'Hass' plantings is questionable. It is clear that future rootstock research should focus not only on disease resistance but also on horticultural aspects such as tree productivity.

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Table 1. Trunk circumference and yield of 'Hass' trees as influenced by three clonal rootstocks.

	Trunk circumference (cm)		Yield (kg)	
Rootstock	1989	1990	1989	1990
Duke 7	33.7 b[z]	45.6 b	2.08 a	33.46 a
G6	34.4 b	46.4 b	0.48 b	14.52 b
G755C	37.5 a	54.6 a	1.03 b	5.55 c

[z] Mean separation in columns by Duncan's multiple range test, ($P<0.05$).

Table 2. Influence of Duke 7, G6 and G755C rootstocks on 'Hass' fruit length, fruit diameter, length/diameter ratio (L/D) and seed weight.

Rootstock	Length (cm)	Diameter (cm)	L/D	Seed weight (% of total fruit weight)
Duke 7	9.6 a[z]	7.3 c	1.3 a	21.4
G6	10.5 b	7.2 b	1.5 b	18.9
G755C	10.6 b	7.1 a	1.5 b	18.6

[z] Mean separation in columns by Duncan's multiple range test, ($P<0.05$).