

## POSSIBLE MEANS TO INCREASE HASS AVOCADO FRUIT SIZE

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### Abstract

Various approaches to solving the Hass small fruit problem are dealt with, viz. the influence of Hass tree condition on the proportion of small fruit, the effect of Ettinger as pollen donor for Hass, the effect of a paclobutrazol treatment on the yield of export size fruit and an evaluation of new Hass selections. The influence of Hass tree condition on the proportion of small fruit was evaluated over a period of three years. The percentage of small fruit increased when tree condition deteriorated. Therefore maintaining good tree condition by the correct application of cultural measures is essential in Hass. With regard to testing Ettinger as pollen donor for Hass, no conclusive results have been obtained on Hass yields and fruit size as yet. A foliar spray of paclobutrazol (250 mg a.i. l<sup>-1</sup>) at full flowering increased total yield and the yield of export size fruit in young Hass trees when compared to the untreated control in two consecutive years. Four Hass-like selections and cultivars (T 142, Lamb Hass, Gil, Iriet) are being evaluated as possible replacements for Hass and first results on their postharvest cold storage performance are presented.

### 1. Introduction

On the overseas market, the cultivar Hass is very popular due to its excellent shelf life and eating quality. Fruit with a mass exceeding 160g can usually be exported and best prices are fetched for Hass fruit in the mass range 200g to 300g. However, the major drawback of this cultivar is that it bears a large percentage of undersized fruit causing high financial losses in the South African avocado industry. The objective of this paper is to report on the current status of the different approaches to solving the Hass small fruit problem at Westfalia Estate, South Africa.

### 2. Tree Condition

Hass avocado trees on 'Duke 7 rootstock were used in this study. The trees were planted in 1982 at Westfalia Estate. At harvest in July 1991, June 1992 and July 1993, individual tree yields were recorded for 31 trees. From each tree, fruit were graded into two size categories, i.e. export size ( $\geq 160\text{g}$ ) and small fruit ( $\leq 160\text{g}$ ). The percentage of small fruit was calculated on a mass basis. Tree condition was rated in July, according to a disease index of zero (healthy) to 10 (dead) as described by Darvas *et al.* (1984). In healthy trees, the quantity of export size fruit (kg tree<sup>-1</sup>) increased when total yield increased (figure 1). Apart from the export size yield, every Hass tree bore a proportion of small fruit in the order of 5 - 20 %, independent of total yield,

provided tree condition rating was zero (figure 2). The percentage of small fruit increased when tree condition deteriorated. At a tree rating of 5 or 6, almost the entire crop consisted of small fruit. For a high yield of export size fruit, good condition of Hass trees must therefore be ensured by the correct application of cultural measures, such as irrigation, fertilisation, root rot control and mulching.

### 3. Ettinger as Pollen Donor for Hass

Three-year old Hass trees planted at a spacing of 5 x 5m in square one hectare blocks bordering an Ettinger row at two sides, were used. The yield of the Hass trees was measured with increasing distance from Ettinger trees in 1995. The proportion of export size Hass fruit was determined (as described above). Fruit samples were taken at a distance of 5m and 50m from an Ettinger row and assayed for the isozyme system triosephosphate isomerase (TPI) at the Institute for Tropical and Subtropical Crops in Nelspruit to determine the pollen parent.

Cross pollination between Ettinger and Hass occurred widely and small and large seeded Hass fruit differed in their isozyme pattern. However, no conclusive results with regard to Hass yield have been obtained yet in contrast to findings by Guil and Gazit (1992).

### 4. Paclobutrazol foliar spray

Hass avocado trees on Duke 7 rootstock were used in this experiment. The trees were planted in 1991 at Westfalia Estate. The plant growth regulator paclobutrazol (250 mg a.i. l<sup>-1</sup>) was applied as a foliar spray at full flowering in September 1993 and 1994. The control trees were left untreated. At harvest 1994 and 1995, individual tree yields were taken. The fruit were then pooled per treatment and sent over a mass sizer to determine the proportion of export size fruit.

Table 1 – Total yield (kg tree<sup>-1</sup>) and proportion of export size fruit as influenced by a foliar spray of paclobutrazol (250 mg a.i. l<sup>-1</sup>). Data are the means of 24 trees  $\pm$ SE.

	Total yield (kg tree <sup>-1</sup> )		Export size fruit (%)	
	1994	1995	1994	1995
Paclobutrazol	2.98 $\pm$ 0.47	22.84 $\pm$ 1.59	78	83
Control	1.69 $\pm$ 0.63	16.22 $\pm$ 1.84	70	86

In 1994 and 1995, paclobutrazol significantly increased total tree yield and in 1994 paclobutrazol also increased the proportion of export size Hass fruit when compared to the control (table 1). In Australia, spraying of Hass trees with higher rates of paclobutrazol than reported here resulted in similar improvements regarding yield and fruit size (Whiley *et al.*, 1991).

## 5. New Hass-like Selections and Cultivars

Four Hass-like selections and cultivars, (T142, Lamb Hass, Iriet, Gil) and Hass as standard, have been topworked on 7 year-old Hass trees on Duke 7 rootstock. Twenty trees were used per selection. Topworking started in 1993 and was completed in 1994.

In 1995, some of the topworked trees bore their first crop. So far all four selections have produced larger fruit than Hass with T142 fruit tending to be too large (mean fruit mass 450g) and Lamb Hass having a good size (mean fruit mass 274g). Hass ripened from June to August, T142 ripened from August to September and Lamb Hass matured from July to October. T142 and Lamb Hass were stored for four weeks at PC together with Hass control fruit to simulate shipment to Europe. After cold storage the temperature was increased to 18°C to induce ripening. Soft-ripe T142, Lamb Hass and Hass fruit were cut open and were found to be free of physiological disorders and diseases. However, with regard to taste T142 and Lamb Hass fruit were slightly inferior to Hass fruit. Little information has been gained to date about Gil and Iriet as they have only produced very few fruit yet. Both cultivars seem to mature later than Hass under South African growing conditions.

## References

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