

## Hass avocado yields as affected by dwarfing rootstocks and flower pruning

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### **ABSTRACT**

Potentially dwarfing rootstocks Wilg, Colin V-33 and Ryan were tested for the avocado cultivar Hass. Colin V-33 was also tested as a potentially dwarfing interstock between Hass and Duke 7. During the first four years from planting there was a marked difference in tree vigour caused by Wilg rootstock, but after that all the trees had similar vigour to Hass on Duke 7. The cumulative yields of Hass on Ryan and Wilg were similar to Hass on Duke 7 after 6 years. Using Colin V-33 as an interstock has had very little influence on tree vigour and yields, when compared to Hass on Duke 7. Flower pruning of Hass trees when entering an "on" year resulted in less alternate bearing and larger fruit size. Flower pruning at inflorescence stages before full flower have given the best results to date

### **INTRODUCTION**

Tree size of avocado may be controlled either by pruning and application of growth regulators, which are expensive, short term actions, or alternatively, by using low vigour rootstocks, the genetic, long term solution. In an attempt to find potentially dwarfing rootstocks, the rootstocks Wilg, Colin V-33, and Ryan were compared to the industry standard, Duke 7.

Alternate bearing of Hass avocado is also a great problem worldwide, leading to great instability in supply to importing countries, as well as uncertainty in the budgeting of avocado growers. There is also a major component of under-sized, unmarketable fruit during the "on" seasons.

From 1994 to 1998, a research project was carried out to investigate the effect of flower pruning at full flower on Hass avocado yields, fruit size and alternate bearing patterns (Roe & Morudu, 1999). This research showed advantages of larger fruit, but not necessarily greater yields, from flower pruning trees entering a distinct "on" year. A natural outflow from this research was to look at timing of flower pruning, as research done by Farre *et al.* (1987) suggested that earlier pruning was beneficial in Spain.

In this report, data from a project to investigate the time of flower pruning on Hass avocado yields, fruit size and alternate bearing, as well as results from dwarfing rootstock and interstock trials, are given.

## **MATERIALS AND METHODS**

### **1. Dwarfing rootstocks and interstock**

The rootstocks Wilg (an escape tree with a low vigour, weeping growth habit), Colin V-33 (a Mexican import which had dwarfing effects as an interstock for Fuerte; (Barrientos-Priego *et al.* 1987), and Ryan (a low vigour fruiting cultivar) were selected for their potential ability to impart low vigour to Hass, compared to Duke 7. In 1993, a trial of 15 to 20 trees of each rootstock was planted at Westfalia Estate.

Colin V-33 as an interstock between Duke 7 rootstock and Hass, was planted in 1995 in a semi-commercial orchard. Two lengths of interstock were tried, viz. 10 cm and 20 cm. Tree size and yield data are presented.

### **2. Flower Pruning**

Five-year-old Hass avocado trees on Duke 7 clonal rootstock, expected to enter an "on" season, were selected and about 10 cm were cut off the tips of the branches using a machete, as high up as could be reached. Above that height, extending pruning shears were used. The flower pruning treatments applied were as follows to 20 trees each:

1. Unpruned control
2. Pruned at bud swell
3. Pruned at bud break
4. Pruned at cauliflower stage
5. Pruned at full flower
6. Pruned at fruit set

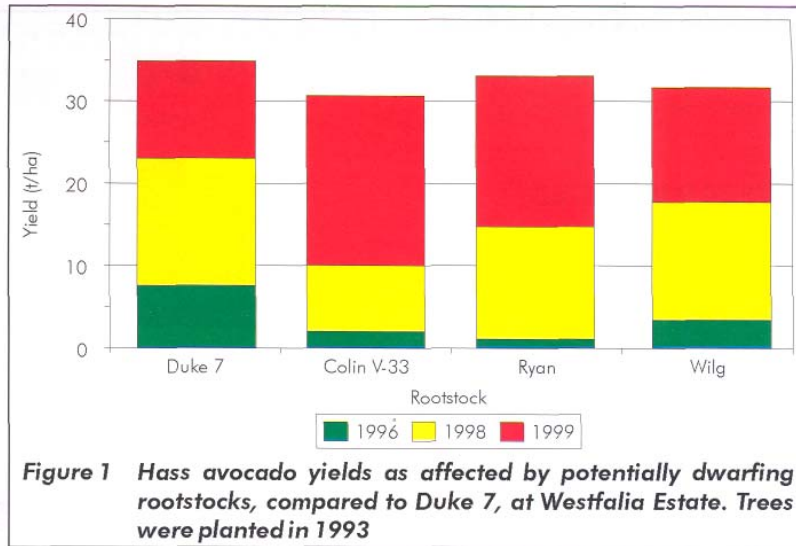
Fruit yields and size distribution were measured.

## **RESULTS AND DISCUSSION**

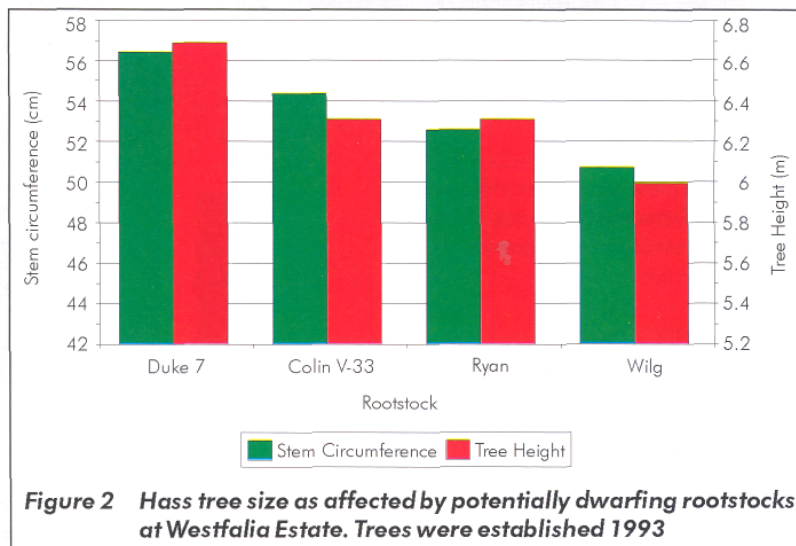
### **1. Dwarfing rootstocks and interstock**

Progress on this trial was reported previously (Roe *et al.* 1995; 1996; 1997; 1998) and data are merely updated in this paper.

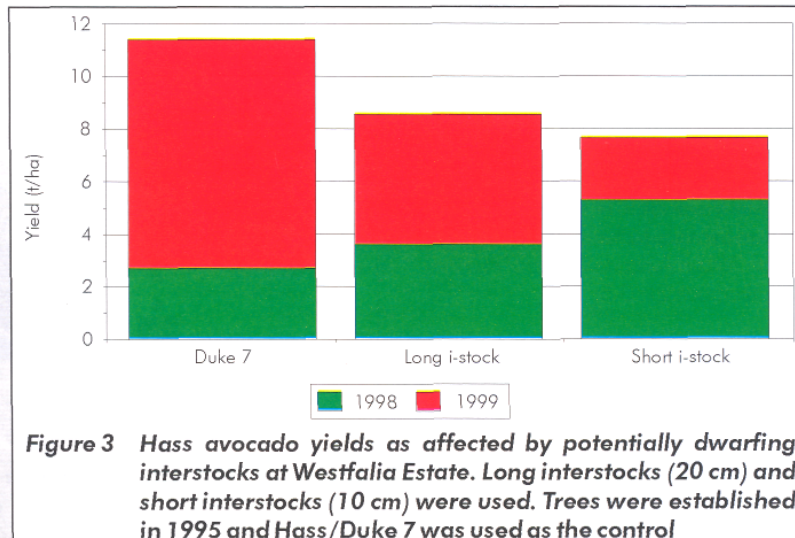
Hass fruit yields from the dwarfing rootstocks were quite acceptable when compared to Duke 7 (Figure 1), although Colin V-33 and Ryan were slower in producing good yields, than was Duke 7.



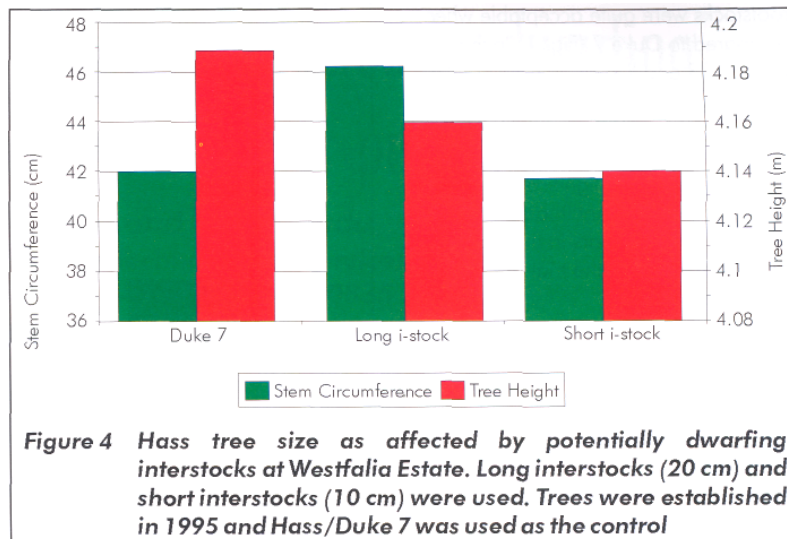
The rootstock Wilg was initially very dwarfing and exhibited what appeared to be problems with lignification of the stems, where they bent in an S shape. However, after six years in the ground, all the Hass trees in the trial are now of similar size (Figure 2).



Interstocking with Colin V-33, has resulted in lower cumulative yields than Hass/Duke 7 over the first two harvest seasons of the trial (Figure 3).

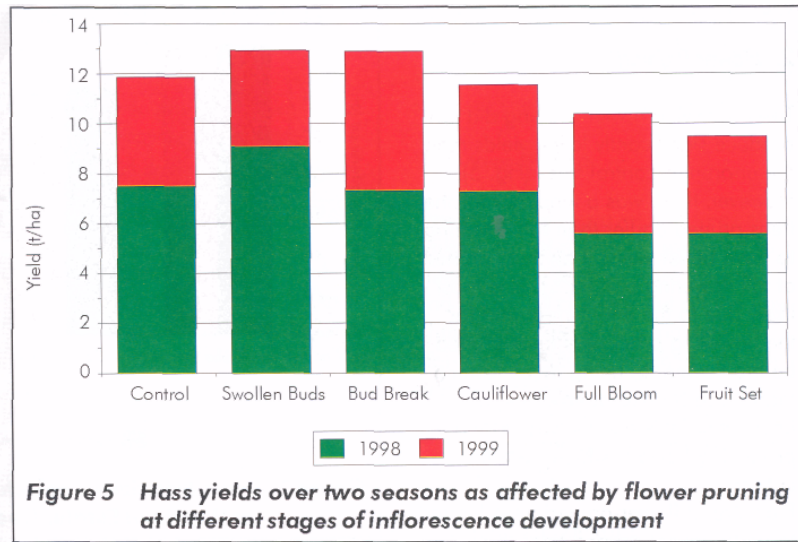


There is no discernable difference in tree size between the different interstock lengths, nor between interstocked vs. non-interstocked trees (Figure 4).



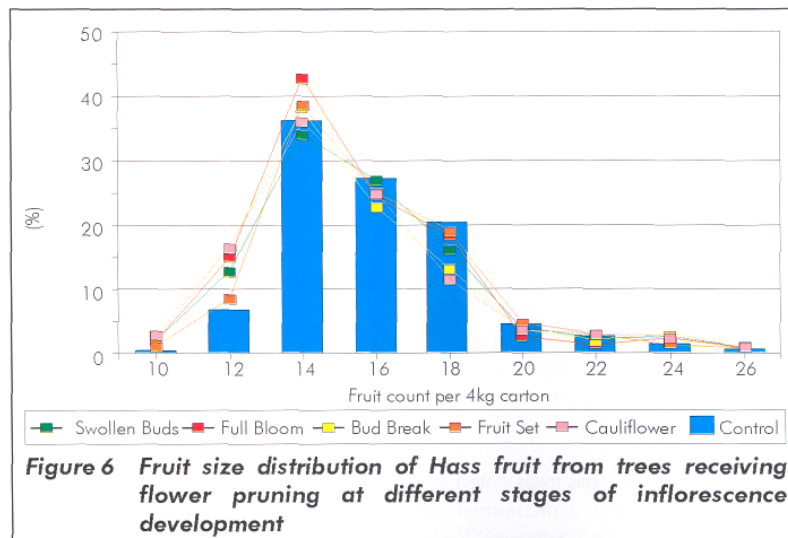
## 2. Flower Pruning

Trees receiving flower pruning did not produce significantly lower yields than the unpruned control trees (Figure 5).



However, there was a tendency for the trees pruned earlier than full flowering to have better yields than trees pruned at full flowering or later. This is most likely due to the energy required for the flowering process of trees pruned before flowering, being much lower than those pruned at flowering or later, where this energy was wasted in producing flowers, which were then cut off.

Fruit size of flower-pruned trees tended to be larger for pruned trees than unpruned trees (Figure 6), although there was a component of small fruit in all treatments.



## CONCLUSIONS

The concept of dwarfing rootstocks and interstock for Hass avocado is still theoretical and none of the rootstocks tested resulted in significant dwarfing. As alternatives to

Duke 7, the rootstocks Wilg, Ryan and Colin V-33 were acceptable in terms of yield. At this stage, tree size control should be achieved by pruning and growth regulator applications.

Flower pruning of Hass trees entering a heavy "on" season is recommended at flowering stages before full flower. Studies are required to investigate effects of flower pruning on other alternate bearing cultivars such as Lamb Hass.

### **LITERATURE CITED**

- BARRIENTOS-PRIEGO, A., LOPEZ JIMINEZ, A & SANCHEZ COLIN, S. 1987. Effect of cv Colin V-33 as interstock on avocado (*Persea americana* Mill) growth, cv Fuerte. *South African Avocado Growers' Association Yearbook* 10: 62-64
- FARRE, J. M., HERMOSO, J. M. & PLIEGO, F. 1987. Effects of pre-bloom pruning on leaf nutrient status, growth and cropping of the avocado cv Hass. *Proceedings of the World Avocado Congress, 4-8 May 1987, CSIR, Pretoria South Africa. South African Avocado Growers' Association Yearbook* 10: 71-72
- ROE, D. J., CONRADIE, W. & KÖHNE, J. S. 1995. Progress with rootstock research at Merensky Technological Services. *South African Avocado Growers' Association Yearbook* 18: 10-11
- ROE, D. J., KREMER-KÖHNE, S. & KÖHNE, J. S. 1996. A progress report of avocado rootstock research at Merensky Technological Services. *South African Avocado Growers' Association Yearbook* 19: 26-27
- ROE, D. J., KREMER-KÖHNE, S. & KÖHNE, J. S. 1997. Avocado rootstock and cultivar evaluation at Merensky Technological Services: a progress report. *South African Avocado Growers' Association Yearbook* 20: 36-38
- ROE, D. J., MORUDU, T. M. & KÖHNE, J. S. 1998. Commercial avocado rootstock evaluation at Merensky Technological Services: further progress in 1997. *South African Avocado Growers' Association Yearbook* 21: 3-5
- ROE, D.J. & MORUDU, T. M. 1999. Flower pruning of Hass avocado when going into an "on" year in an attempt to decrease alternative bearing and increase fruit size. *South African Avocado Growers' Association Yearbook* 22: 84-86