South African Avocado Growers' Association Yearbook 1999. 22:84-86

Flower pruning of Hass avocado when going into an *"on"* year in an attempt to decrease alternate bearing and increase fruit size

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ABSTRACT

The tendency for Hass avocado frees to flower excessively during one year, resulting in an "on" year with many small, sunburnt fruit, followed by a small crop during the next season, prompted this research into flower pruning. Hass trees displaying this phenomenon, were selected and about 25-30% of flowers removed. During the first year after pruning, marked improvements in fruit size resulted in better pack-out and hence profitability. Alternate bearing was decreased in the following year. Flower pruning during the next expected "on" year was not as convincing, as this turned out to be a small cropping year. Flower pruning was found to be a fairly reliable tool for balancing out alternate bearing of Hass, but only during extreme "on" years

INTRODUCTION

Hass avocado trees have a tendency to flower very heavily in some years resulting in a large crop with a high proportion of small fruit. This heavy flowering is usually accompanied by excessive leaf drop and a high proportion of determinate flowers (branches ending in a flower with no apical bud to continue growth) resulting in no spring flush from that branch. Fruit borne by determinate inflorescences are at a disadvantage as there is neither enough of a photosynthetic factory to supply the needs of developing fruitlets resulting, in a high proportion of small fruit, nor any protection of fruits from sunburn by the spring flush. This large "on" crop is almost always followed by a marked "off" season with a very small crop, and the tree is forced into a heavily alternate bearing cycle.

Inspired by investigations into this problem in Spain (Farre *et al*., 1987), research into flower pruning of Hass trees was initiated in 1994 at Westfalia Estate with the aim of minimising small fruit production and sunburn, as well as eliminating alternate bearing.

MATERIALS AND METHODS

In 1994, an eight-year old Hass orchard, at a spacing of 7 x 7m, displaying symptoms of heavy flowering and defoliation, with a high proportion of determinate flowering, was

selected. Twenty trees were pruned while 20 trees were left unpruned. Flowers were pruned between full bloom and about 10% fruit set. Determinate flowers were targeted so that 20-30% (about every fourth branch) of terminal panicles were removed. Branches were pruned by removing about 30 cm from the terminal, which removed 5-10 panicles per branch, but still left a few panicles to bear. No pruning was carried out in 1995 and 1997. In 1996, pruning was repeated due to the expectation of an "on" year because of hail damage to the block in December 1995, but did not materialise.

Tree yields were measured in kg/tree and this was extrapolated to t/ha; fruit size, and export percentages were determined annually.

RESULTS AND DISCUSSION

During 1995 the crop, following the first flower pruning, showed little difference in yields between unpruned versus pruned trees. However there was a large difference in the export pack-out (79.9% fruit larger than count 20 for pruned trees compared to 60.2% for unpruned trees) (Fig. 1A.), which was in agreement with the results of Farre *et al.,* (1987). This resulted in considerably greater returns to the grower. The crop which followed in 1996 was much larger for trees pruned in 1994 than for unpruned controls (Fig 1B), and the exportable percentage was slightly higher in the case of flower pruned trees. The income earned from pruned trees was more than double that of control trees.

Flowering intensity of 1996 was high, but not excessive, but a decision was made to prune flowers again in 1996; two years after initial pruning. This resulted in an average crop from unpruned control trees compared to a negligible crop from flower-pruned trees (Fig 1C); the expected "on" crop of 1997 did not materialise. In this case, flower pruning had the undesirable effect of depressing the crop, most likely due to removal of reproductive wood. This was a strong indication that flower pruning should only take place when completely sure that an "on" crop is eminent. Farre *et al*. (1987) suggested that this type of pruning should take place during flowering, only after a severe "off" crop.

During 1998, the flower-pruned trees (Fig 1D) produced a slightly smaller crop with a considerably higher export percentage. Over four years there was very little difference between the total yields (Fig.2), except that flower pruning improved the exportable sizes.

CONCLUSIONS

Flower pruning of Hass trees exhibiting symptoms of excessive flowering and an expected large "on" crop benefited from flower pruning, especially economically. However, this trial would indicate that it is clearly better to remove flowers only after a distinct "off" year. Flower pruning could become a useful management tool to rectify alternate bearing and improve fruit size on a tree to tree basis, but should not be applied to whole orchards. The timing of flower pruning was not investigated in this study, and should be undertaken in further investigations into flower pruning.

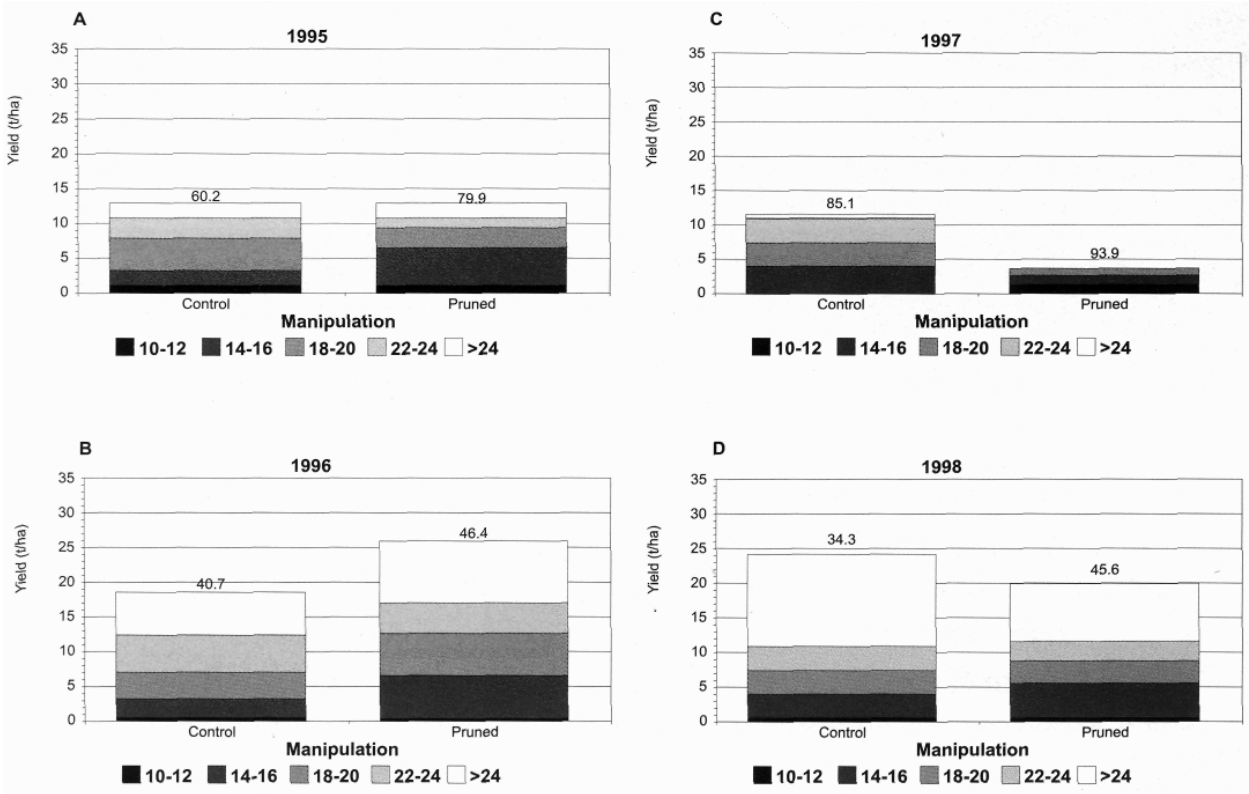

Figure 1. Effect of flower pruning when going into expected "on" years of eight-year old Hass trees displaying symptoms of excessive flowering and simultaneous leaf drop over a period of low years (A-D). Flower pruning was carried out during flowering of 1994 (approaching an "on" year) and 1996 (expected "on" year; actually "off" year). The number above each bar indicates the export percentage including fruit size up to count 20.

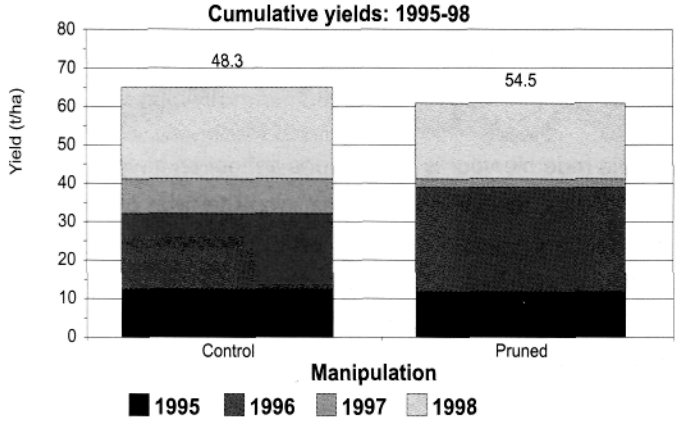

Figure 2. Cumulative yields from 1995 to 1998 of Hass trees after flower pruning when entering expected "on" years, compared to unpruned control trees. The numbers above each bar indicate the export percentage including fruit size up to count 20.

ACKNOWLEDGEMENTS

Funding of these projects was by the Hans Merensky Foundation and later partly by SAAGA. The management inputs of Koos van Rensburg, Philip Mofokeng and Lucas McLean, and the technical assistance of Terrence Mookamedi and Malan Selowa are gratefully acknowledged.

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