

GIRDLING OF 'FUERTE' AVOCADO IN SUBTROPICAL AUSTRALIA

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ABSTRACT

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Girdled limbs of 'Fuerte' avocado produced a bigger crop than controls for 3 consecutive years. Limbs girdled for 4 consecutive years yielded the same as the control, but healed slowly. Yield was maintained in the year after girdling was stopped. The number of seedless fruit was not increased by girdling.

INTRODUCTION

Although 'Fuerte' is the main commercial cultivar of avocado (*Persea americana* Mill) in Australia, it often yields poorly in New South Wales (Chalker and Robinson, 1969), as it does in California (Hodgson and Cameron, 1935), and in Israel (Lahav et al., 1969).

Girdling increased the yield of avocados in California (Hodgson and Cameron, 1937), the increase being greater in the first year after treatment than in the second. It also increased yield in Israel for 3 years when the trees were girdled annually (Lahav et al., 1971a).

No girdling work on avocado has been reported in Australia, and elsewhere this work has not been extended to 4 consecutive years.

Experiments were started in 1971 to see if girdling could increase the yield of trees on the North Coast of New South Wales.

MATERIALS AND METHODS

A grove of 14 eleven-year old avocado trees, spaced 8 m × 8 m, was selected at the Tropical Fruit Research Station, Alstonville (latitude 28° 51' S) for the investigations. Girdles were applied in June, 6 to 8 weeks before full

blossom (Schroeder, 1951) and the crop was harvested in May the following year. Some limbs were given 4 consecutive girdlings to test continuous girdling, and some were girdled in 2 consecutive years and then rested for a year.

In 1971 two similar limbs were chosen on each tree. One selected at random was girdled by a saw cut 2 mm wide to sever the phloem. Another limb, similar to the two chosen in 1971, was selected on each tree in 1972. On 7 of the trees these new limbs, and those girdled in 1971, were girdled and the original controls left as controls. On the other 7 the controls for 1971 and those girdled in 1971 were girdled and the new limbs left as controls. The width of the girdle was increased to 6–12 mm depending on size, and a hacksaw with 2 parallel blades was used to remove the phloem leaving the cambium exposed.

In 1973 only the girdled limbs were done again and in 1974 only the limbs that had been girdled 3 times were done again.

At each harvest the total number of fruit, the number less than 8 cm in diameter, the number of seedless fruit and the total weight were recorded for each experimental limb. Total tree yields and time taken for the girdles to heal were measured. Each year at full blossom, leaf colour was scored from 1 (dark green) to 5 (bronze). All data were analysed using standard analyses of variance. The grove was managed as a commercial one during the experiments.

RESULTS

Girdling significantly increased yield of fruit ($P < 0.01$) and the total number of fruit ($P < 0.05$) for the 1972, 1973 and 1974 harvests (Table 1). Girdling also increased the percentage of fruit less than 8 cm in diameter ($P < 0.01$) for the 1973, 1974 and 1975 harvests. At the 1975 harvest, limbs that had been girdled for 4 consecutive years produced the same weight and number of fruit as the controls. The limbs that had been girdled in 1972 and 1973 and left in 1974 (GG) gave similar production to the controls in 1975.

Very few fruit were seedless (an average of 1 per limb) and the number was not affected by girdling.

In 1973 the leaves on the ungirdled limbs were darker (mean score 1.6) than those on the girdled limbs (3.1 and 3.5) which were the same ($P < 0.01$). In other years there were no significant differences in colour score.

For the first 3 years all girdles healed within 3 months. However, in 1975 after 18 months only 85 % of the fourth consecutive girdle had healed.

DISCUSSION

The results showed that girdling can be applied 3 years in a row without retarding wound healing. In each of these years girdling increased limb yield. However, girdling 4 years in a row resulted in retarded wound healing in the fourth year although yield was similar to the control. Limbs girdled for 2 consecutive years (1972, 1973) and then rested for a year (1974) did not

TABLE 1

Mean weight and number of fruit for ungirdled and girdled limbs (1972 to 1975) of 'Fuerte' avocados grown at Alstonville, N.S.W. U = ungirdled; G = girdled; number of G's = cumulative number of girdles. Means with different superscripts within a year are significantly different $P < 0.01$ for weight and $P < 0.05$ for others. Number in brackets, means of square root transformed data.

Girdle applied	Harvest	Treatment	Weight (kg/limb)	Number of fruit/limb	Percentage of fruit < 8 cm diameter
1971	1972	U	15.4 ^b	65 (7.1) ^b	76
		G	23.7 ^a	98 (8.8) ^a	77
1972	1973	U	23.1 ^b	83 (8.8) ^b	58 ^b
		G	31.1 ^a	122 (10.6) ^a	68 ^a
		GG	28.7 ^a	119 (10.4) ^a	75 ^a
1973	1974	U	10.9 ^b	38 (5.6) ^b	53 ^b
		GG	19.0 ^a	78 (8.1) ^a	81 ^a
		GGG	18.4 ^a	69 (7.9) ^a	78 ^a
1974	1975	U	26.2	108 (10.1)	88 ^b
		GG ¹	21.3	97 (9.5)	94 ^{ab}
		GGGG	21.6	115 (10.3)	98 ^a
Standard Error of each mean			1.8	— (0.4)	3

¹ Not girdled prior to 1975 harvest.

show an increased yield in 1975.

Lahav et al. (1971a) recommended that only one-half to two-thirds of a tree should be girdled in any one year. Since girdling for more than 3 consecutive years of the same limb is detrimental, this should be avoided by local growers.

Lahav et al. (1971a) noted that girdling of one-third to one-half of the limbs reduced the yield of ungirdled limbs. Because only one-fifth or one-tenth of the limbs of each tree were girdled and the yield of the ungirdled limbs remained constant, we consider that girdling of a particular limb did not significantly affect the yield of other limbs.

Although the yield in all years were high alternate bearing was observed (Table 1). Similar responses to girdling were observed before both an "on" and an "off" year in contrast to only before an "off" year in Israel (Lahav et al., 1971a) and California (Hodgson and Cameron, 1937).

Lahav et al. (1971b) showed that girdling greatly increased the number of seedless fruit, but at Alstonville girdling did not affect this number.

An increase in the percentage of small fruit was observed. This is consistent with Lahav et al. (1971b), who reported that girdling reduced the mean fruit weight. Returns have favoured smaller fruit (200-250 g) in some Australian markets, particularly Melbourne.

No leaf chlorosis was observed due to girdling as reported by Lahav et al. (1971b). A temporary leaf colour reduction (paling) after flowering occurred only in the 1973 season.

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