

Effect of Girdling on Fruit Set of Fuerte Avocado Variety

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Summary

Girdling of Fuerte avocados before blossom, at full blossom, and after full blossom for four consecutive years did not affect the cambial growth of the trees. Although there were no significant differences in yields among the different treatments, girdling before blossoming gave in all four years higher yields. Individual fruit weight was lower when girdling was done before blossoming, compared to the other treatments. The number of seedless fruits was not affected by girdling.

Introduction

Unsatisfactory bearing has always been a major commercial problem in avocado trees (Coit, 1921). Yields too often bear little relationship to the usually excellent vegetative growth and flowering, especially in the Fuerte avocado variety (Trochoulis and O'Neil, 1976).

No satisfactory solution to this problem has yet been obtained. Girdling has been practiced to increase productivity in some deciduous fruit trees (Griggs and Schrader, 1941) and in citrus (Rackham, 1966). Girdling commonly induces increased amounts of elaborated plant materials and of growth substances in the branch girdled, and presumably induces conditions more favorable for fruit set development (Murneek, 1941).

Girdling of avocado branches has been tried with different cultivars of avocado, but mainly with Fuerte, since shy bearing is one of the major problems with that cultivar. The results were promising, and it was found that girdling increased the yield of avocados in Israel (Lahav *et al*, 1971), in Australia (Trochoulis and O'Neil, 1976), and in California (Bergh, 1976).

No work has been reported in Cyprus on girdling of avocados; this work aimed at studying the effect of girdling and time of its application on fruit set, and consequently on yield and on growth of Fuerte avocados grown in Cyprus.

Materials and Methods

Trees of the variety Fuerte on Mexican rootstock were used. The trees, 8 years old, were selected to be uniform in size and vigor at the Kouklia Government Farm of the Department of Agriculture.

The soil was a well drained sandy-clay loam with a CaCO₃ content of 35% and a pH of 8.2 (measured on a 1:2.5 soil:water suspension). The area has an average annual rainfall of 420 mm, mainly during the period October to April, and mean maximum air temperatures ranging from 17 °C to 33°C in July, with mean minima from 0°C to 21°C. Relative humidity ranges between 70% to 80% during the winter months, and from 60% to 70% in the summer. The trees were irrigated by mini-sprinklers and the water used — obtained from boreholes — had a pH of 7.3 and an electrical conductivity of 0.8 mmhos/cm. Annual spring fertilizer dressings of 3kg ammonium sulphate, 0.5 kg triple super-phosphate, and 1 kg potassium sulphate were applied. The orchard was cultivated with rotavators to suppress weeds, and the trees were pruned as required.

The treatment combinations used were: 1) girdling before blossom (December), 2) girdling at full blossom (April), 3) girdling after full blossom (May), and 4) control (no girdling). As many as half of the main branches of each tree were girdled by removing a band of bark (5 mm wide) down to the wood. The same branches in each tree were girdled in four consecutive years (1982-85).

A randomized complete block design with five replications was used, each replication consisting of one tree. Fruit weight, total yield, and trunk circumference measured at a fixed point 15 cm above the bud union were recorded. Observations were also made on the time required for the girdles to heal, on leaf color, and on tree growth and development.

Results and Discussion

The average growth of trees in the different treatments, as indicated by the increase of trunk circumference, is shown in Table 1. There was no statistical difference between treatments, indicating that girdling of trees at different stages did not affect the cambial growth as indicated by the increase of trunk circumference. From observations made on the girdled branches, girdles healed within three months: and girdling can be applied for four consecutive years on a branch without retarding wound healing. The 'Fuerte' trees in all treatments had a spreading habit of growth and no symptoms of leaf chlorosis due to girdling were observed.

Annual yields per tree are also shown in Table 1. There were no significant differences among yields of the four treatments over the four-year period: however, girdling before blossoming gave higher yields throughout these experiments. This is in agreement with Lahav *et al*, 1971, Trochoulis and O'Neil, 1976, Bergh, 1976, and Malo, 1971, who reported that girdling increases yields of avocado in Israel, Australia, California, and Florida, respectively.

Mean fruit weight is shown in Table 2. In 1983, the weight of fruit of the trees on which girdling was done before blossoming was statistically lower compared to those of the other three treatments: whereas, in 1982 and 1984 these fruits were statistically smaller only compared to those of the control and girdling at full blossoming. In 1985, although the results were the same, the differences were not statistically significant. The increase in the percentage of small fruits when girdling was applied before full blossoming is consistent with the findings of Lahav *et al*, 1971 and Trochoulis and O'Neil, 1976, who

also reported that girdling before blossoming reduced mean fruit weight. This could be an advantage, because the market prefers medium size fruits (250g) to large ones.

Very few fruits were seedless, and their number was not affected by girdling. This is in agreement with the findings of Trochoulias and O'Neil, 1976.

Table 1. Tree growth and yield of Fuerte avocados.

Treatments	Increase in trunk circumference (cm)		Yields per tree (kg)			
	1981	1985	1982	1983	1984	1985
1) Girdling before blossoming	9.2		30	58	85	75
2) Girdling at full blossom	9.7		20	34	61	52
3) Girdling after full blossom	9.4		20	24	71	60
4) Control	9.6		19	35	69	57
S. E.	0.7		4.1	8.3	13.4	10.6
C.V. %	17		41.1	49.1	49.1	38.8

No significant differences were found among treatments.

Table 2. Average fruit weight of Fuerte avocados.

Treatments	Mean Fruit Weight (g)			
	1982	1983	1984	1985
1) Girdling before blossoming	262b*	238b	233b	243a
2) Girdling at full blossom	304a	302a	296a	284a
3) Girdling after full blossom	289ab	290a	270ab	258a
4) Control	319a	282a	273a	260a
S. E.	9.3	11.5	13.8	13.5
C.V. %	7.1	9.2	11.5	11.5

*Means in the same column bearing the same letter are not significantly different (P<0.05).

References

- Bergh. B. O. (1976). Factors affecting avocado fruitfulness. *Proc. First Internat. Trop. Fruit Short Course, The Avocado*. 83-88.
- Coit. J. E. (1921). The effect of girdling the avocado. *Ann. Rpt. California Avocado Assoc.* 1920. 21:69-70.

- Griggs. W. H.. and Schrader. A. L. (1941). Effect of branch ringing before and after blossoming on fruit set of the Delicious apples. *Proc. Amer. Soc. Hort. Sci.* 38:89-90.
- Lahav. E.. Gefen. B.. and Zamet. D. (1971a). The effect of girdling on the productivity of the avocado. *J. Amer. Soc. Hort. Sci.* 96(3):396-398.
- Malo. S. E. (1971). Girdling increases avocado yields in South Florida. *Proc. of the Tropical Region. Amer. Soc. Hort. Sci.* 15:19-25.
- Murneek. A. E. (1941). Relative carbohydrates and nitrogen concentration in new tissues produced on ringed branches. *Proc. Amer. Soc. Hort. Sci.* 38:133-136.
- Rackham. R. L. (1966). Girdling mature Navel orange. *Citrograph.* 51:398-408.
- Trochoulis. T.. and O'Neil. G. H. (1976). Girdling of 'Fuerte' avocado in subtropical Australia. *Scientia Horticulturae.* 5(3):239-242.