

AVOCADO HIGH DENSITY PLANTING — A PROGRESS REPORT

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ABSTRACT

Hass avocado trees on Duke 7 rootstock were planted at a standard density of 400 trees per hectare and also at a high density of 800 trees per hectare. The growth retardant paclobutrazol was repeatedly applied to all trees in the high density planting (HDP), while the trees in the standard density planting (SDP) remained untreated. Paclobutrazol applications controlled tree size in the HDP. The cumulative yield for the first three years of cropping was 34,4 t/ha in the HDP and 17,6 t/ha in the SDP. Although the HDP is more expensive to plant and maintain, the point of break-even is reached earlier than in the SDP.

INTRODUCTION

In avocado growing, tree size control would allow closer tree spacing and thereby higher initial yields per hectare. Until such time as dwarfing avocado rootstocks may become available, the excessive vegetative growth of avocado trees can be controlled by applying the growth retardant paclobutrazol (Köhne & Kremer-Köhne, 1987; Symons & Wolstenholme, 1989).

The objective of this study was to put the concept of a high density planting to the test, using the growth retardant paclobutrazol to achieve dwarfing. This is an update on a previous report (Köhne & Kremer-Köhne, 1990).

MATERIALS AND METHODS

Hass avocado trees on Duke 7 rootstock were planted at a density of 400 trees per hectare (standard density planting, SDP) and 800 trees per hectare (high density planting, HDP) in March 1986. Paclobutrazol (PBZ) was applied to all trees in the HDP from 1987 to 1989, while the SDP trees remained untreated. Details on PBZ rates, method of application and intervals between treatments in this experiment have been described by Köhne & Kremer-Köhne (1990). In 1990, PBZ treatment was discontinued. During the first three years of cropping, data on trunk circumference and yield of 50 trees were recorded for each of the SDP and HDP planting.

Yield per hectare as well as cash flow (in Rand) were calculated, using the yield data obtained from this trial. The calculations were based on the following assumptions:

- * soil preparation, installation of micro-irrigation and planting of 400 trees (SDP) costs approximately R15000 ha⁻¹. In the HDP, costs are R19 000 ha⁻¹ due to the additional 400 trees
- * orchard maintenance (weed and disease control, irrigation, fertilisation) costs approximately R3 000 ha⁻¹ per annum in the SDP (HDP: additional costs for PBZ application of R500 ha⁻¹ per annum);
- * value of fruit "back on the farm", i.e. proceeds minus cost of picking, packing, shipping and marketing: R1 500 t⁻¹;
- * neither inflation nor interests on investment were taken into account.

RESULTS AND DISCUSSION

Considerable reduction of vegetative growth was obtained through PBZ-treatment of avocado trees. Trunk circumference of SDP trees was 41 cm in 1989 and 51 cm in 1990, while HDP trees measured 35 cm in 1989 and 41 cm in 1990. With considerably smaller trees in the HDP, it was possible to produce fruit from twice the number of trees, i.e. 800 trees per hectare until August 1990, when crowding occurred and thinning became necessary.

In the HDP, the cumulative yield (1988-1990) per tree was 2% lower when compared to the SDP. However, this slight reduction in yield per tree in the HDP is irrelevant, as the yield per hectare was increased by 95% in the HDP due to the fact that there are twice as many trees (Table 1).

TABLE 1 The effect of planting density and paclobutrazol (PBZ) treatment on yield of young Hass avocado trees

Planting density	PBZ treated	Mean yield (kg/tree)			Cumulative yield*	
		1988	1989	1990	kg/tree	t/ha
HDP	yes	1,9	21,3	19,8	43,0	34,4
SDP	no	0,2	26,8	17,0	44,0	17,6

* 1988 — 1990

Although the HDP is more expensive to plant and maintain, the point of break-even is reached at least a year earlier than in the SDP. While the money invested in the SDP has not yet been recovered by the end of year five, the highly productive HDP is already showing a profit of R15 100 per hectare (Table 2).

TABLE 2 Cumulative cash flow for one hectare of Hass avocado planted at standard (SDP) or high density (HDP)

Years from planting	Cumulative cash flow (R)	
	HDP	SDP
0	- 19 000	- 15 000
1	- 22 500	- 18 000
2	- 26 000	- 21 000
3	- 27 220	- 23 880
4	- 5 160	- 10 800
5	+ 15 100	- 3 600

In conclusion, this study proved that there are financial advantages in high density avocado plantings, provided the individual tree produces enough fruit to cover its costs before it has to be removed in order to avoid crowding. The most economical way of tree size control is probably the use of dwarfing rootstocks or interstocks. Investigations into the use of dwarfing rootstocks or interstocks for tree size control are warranted as it is clear that this field of research holds great potential for increasing production.

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