

Plant Growth Regulators

Apogee®

There is currently interest in developing a new growth regulator, Apogee® for use on avocados. Apogee® has been registered to suppress vegetative growth in apples and other temperate fruit crops in Europe and the USA and it is claimed that the product has a reduced environmental profile when compared to the triazoles currently use by the avocado industry, e.g. paclobutrazol and uniconazole. Like the triazoles, Apogee® effects the biosynthesis of gibberellic acid in plants but the pathway through which it acts is thought to be different to the other products. Research on avocados is currently being carried out in California, South Africa and Chile with Apogee® which is a growth retardant already registered for use on apples in Europe and the USA. With apple registration it is more likely that an Apogee® registration is likely to happen for avocados in California providing efficacy can be shown while those countries exporting to markets (Europe and the USA) which do not have triazole registration see this product as a more acceptable chemical for use on avocados. Apogee® is a Japanese product (calcium 3-oxido-5-oxo-4-propionylcyclohex-3-enecarboxylate) and has been commercialised by the BASF Corporation, PO Box 13528, Research Triangle Park, NC27709, USA. Preliminary results from Chile have shown that when Apogee® was foliar applied to avocados at full bloom at 125 g 100 L⁻¹ water with a non-ionic surfactant (Break®) the product increased yield (Table 2). However, when applied at 250 g 100 L⁻¹ of water the yield was significantly reduced possibly due to phytotoxicity. A smaller crop load resulted in larger fruit.

Table 2 Effect of mid-bloom sprays of Apogee® on fruit size and yield of ‘Hass’ avocado growing in Chile. Data are mean values of 4 trees. The planting density of the orchard was 278 trees ha⁻¹ and the results reported are for the 2000/2001 fruiting season (Results courtesy of Sociedad Gardiazabal y Magdahl Ltda).

Treatments*	Yield (kg tree ⁻¹)	Fruit number tree ⁻¹	Mean fruit size (g)	Projected yield (t ha ⁻¹)
Control	53.2	258.5	205.8	14 786
Apogee at 125 g 100 L ⁻¹	79.4	387.8	204.7	22 066
Apogee at 250 g 100 L ⁻¹	32.2	113.0	284.8	8 948

- Apogee® was applied with the non-ionic surfactant Break®.

To date the use of Apogee® to retard summer shoot growth have not been successful even though application rates as high as 400 g 100 L⁻¹ of water have been used. Application of Apogee® is dose sensitive with herbicide effects occurring when too high a volume of the

125g 100 L⁻¹ formulation was applied to trees in mid-bloom in California (Fig. 28).



Fig. 28 An excessive application of Apogee® to ‘Hass’ at mid-bloom in California resulted in reduced leaf size and leaf burn (a) with stimulation of axillary buds in new shoot growth (b). Yield data is not available but from visual inspection there is no apparent gain.

Naphthalene-acetic acid (NAA)

Auxins have been shown to control shoot regrowth on avocado stumps following top-working trees. Regrowth below the graft union when top-working avocado stumps to new cultivars will compete with new scion growth. Hand removal of water-shoots is labour-intensive and expensive. In California it has been shown that shoot regrowth can be controlled by spraying stumps with either a 1% ethyl ester or sodium salt formulation of naphthalene acetic acid (NAA) in a 30% aqueous solution of a white acrylic paint when shoots were 10-80 mm long. Shoots wilted 2 h after treatment and were killed by both NAA formulations 45 days after treatment without any deleterious effect on the newly grafted scions that were shielded at the time of treatment.

In California NAA technology was being applied experimentally to ‘Reed’ trees trained to central leaders and planted at ultra-high density. A 1% NAA formulation made with 1:1 acrylic paint and water was being applied to control tree height after the central leader had been headed back (Fig. 29). The treatment was effectively controlling shoot regrowth for up to 18 months following treatment. This technology warrants investigation under Australian conditions where major cuts are made to trees during canopy management operations.



Fig. 29 The central leader of 'Reed' trees headed back and treated with 1% NAA formulated in 1:1 acrylic paint/water. Shoot regrowth is controlled to about 15 cm below the treated area (California, 2002).