
*Fig. 2.* Color response of 'Keitt' mangos to 6% VG applied 7 days prior to harvest. A. VG treated. B. Control.

surface area (Table 1).

'Keitt' fruit are light green in color with a light red-yellow color mixture on the portion exposed to sunlight at commercial maturity. Fruit were harvested 7 days after spraying with 6% VG. Color measurements showed both an increase in the red color intensity and percentage surface area with red color in response to VG (Table 1, Fig. 2).

'Lippens' mangos are light yellow-green in color at commercial maturity with a small amount of red color on the upper portion exposed to sunlight. Color of ripe fruit is primarily yellow. VG had only a slight effect on red color development (Table 1).

*Effects on postharvest color development and ripening.* Preharvest VG applications had no obvious effect on postharvest development of red color or on loss of chlorophyll and development of yellow color (Fig. 1). Respiration and ethylene production of treated and nontreated fruit were similar and time to reach an edible condition was comparable.

Red color response to VG can be observed as soon as 7 days after spraying, even with lower concn of 2 to 3% (C. R. Barmore, unpublished). High concn, >6%, has been observed to retard chlorophyll degradation in storage. The mode of action of VG on red pigmentation is not understood but appears related to sunlight. Treated fruit receiving full exposure to sunlight respond better than do shaded fruit. Red color development, however, is not enhanced on fruit treated with VG and held after picking under continuous fluorescent light. Color response obtained with VG under grove conditions is under further investigation.

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# Cytokinin-induced Axillary Bud Sprouting in Macadamia[1]

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*Abstract.* **Sprays of a synthetic cytokinin, 6-(benzylamino)-9-(2-tetrahydropyranyl)-9H-purine (PBA), applied to seedlings of *Macadamia tetraphylla* L. in the greenhouse resulted in sprouting of axillary buds, and reduced growth of the terminal shoot. Terminal removal caused lateral shoot development in more seedlings than PBA.**

Macadamia cultivars with predominantly upright growth may be topped mechanically to reduce tree height in developing a spreading scaffold branch system and to facilitate harvesting. Pruning of large limbs significantly increases new shoot growth (8), providing for latitude in shaping the tree. However, pruning is expensive and may reduce yields on mature trees. Growth retardants may be of economical value in reducing terminal growth (1); they did not stimulate lateral shoot growth. Terminal dominance in plants has been overcome with cytokinins (6, 7) and other growth regulators specifically stimulate lateral bud growth in apple and avocado (2, 3, 4, 5, 9). Cytokinins also increased crotch angles of young 'Delicious' apple trees (2), thus allowing a greater limb choice for a permanent scaffold structure.

The stem of 'Johnson' Macadamia has a whorl of 4 sessile leaves at a node and 3 dormant buds in the axil of each leaf. Potentially, it is possible for 12 branches to appear at a single node. The objective of this research was to investigate the use of PBA[3] as an aid in changing the undesirable growth habits in macadamia trees.

Macadamia seeds were planted in 4 liter containers in June 1972. Prior to treatment with PBA, 312 seedlings were selected for uniformity in height and girth. Treatments were started April 6, 1973 when plants averaged 70 cm tall with a circumference of 2.9 cm at 15 cm above soil level.

Aqueous PBA solutions at 250, 500 and 1000 ppm and containing 0.1% of X-77[4] wetting agent were sprayed to run-off at weekly intervals (April 6 to 27). The 26 treatments were 2 controls and 3 concn of PBA, at 4 dates in which the apex was either removed or left intact. There were 12 single-seedling replicates in randomized complete blocks in the greenhouse. Terminal shoots of seedlings in which the apex was removed were cut off 5 days before spraying.

Applications of PBA to seedlings with the apex intact induced sprouting of axillary buds (Fig. 1, 2). Terminal shoots were not killed, but grew at a reduced rate. Lateral bud growth was initiated on 50% of plants treated with 4 foliar sprays of PBA at 500 and 1000 ppm, and 42% with 250 ppm. The fewer the frequency of applications, the

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[3]Shell Development Company kindly supplied PBA (experimental compound SD 8339).

[4]Colloidal Products Corporation of Sausalito, California produces X-77. The principal functioning agents of X-77 are alkylarylpolyoxyethylene glycols, free fatty acids, and isopropanol.

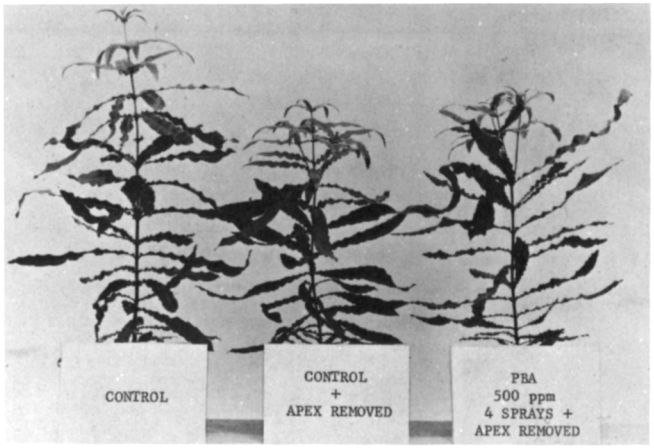


*Fig. 1.* Macadamia seedlings showing control, control with apex removed and 4 sprays of PBA at 500 ppm with apex removed.

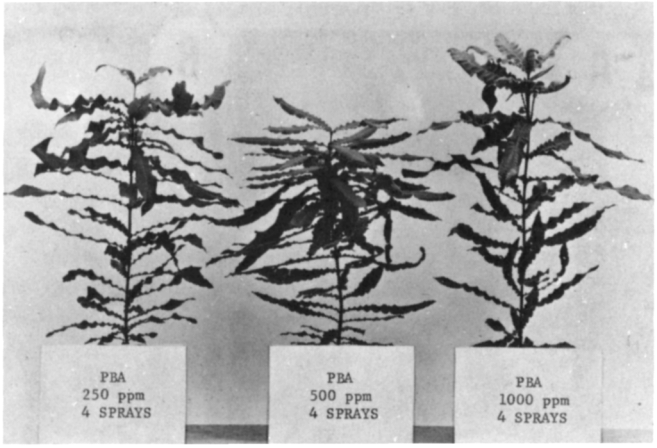


*Fig. 2.* Macadamia seedlings sprayed 4 times with PBA at 250, 500 and 1000 ppm.

smaller was the percentage of plants with laterals developing. Four sprays of PBA at all concn were significantly different from 1 application; other differences are noted in Table 1. There was a significant difference when more than 2 weekly sprays were applied regardless of concn; rate of application was nonsignificant.

No lateral buds were stimulated by any concn with only 1 application. Lateral buds that were stimulated grew at the 3rd or 4th node below the terminal. Each seedling averaged 3 vigorous shoots at the same node. Other laterals stimulated along the trunk were weak and died within a few weeks. The vigorous shoots grew at an angle of 15° to the trunk. When they approached a length of 25 cm, they began drooping from their own weight. Adding weight gradually up to 65 g to each shoot about 15 cm from the trunk for 2 weeks widened the angles to about 50°.

PBA applied at 1000 ppm more than once to a plant caused mild distortion to young leaves near the terminal. No leaf distortion was noted on the axillary bud growth. However PBA did not effect shoot development on seedling with the apex removed. All seedlings with the apex removed produced lateral shoots but the angle between the stubs and main stem averaged 15°, indicating the start of a narrow-crotched tree. Pruning the terminal apex of macadamia seedlings produced more lateral shoots than sprays of PBA; however these lateral shoots will not give the tree size or shape to facilitate harvesting and other cultural practices.

Although PBA cannot be considered a practical means of widening crotch angles, results suggest that chemical control of branch angle may be a feasibility.

*Table 1.* Effect of PBA foliar spray on percentage of lateral shoots developing on macadamia seedlings.[z]

| PBA (ppm) | Weekly applications (no) | Shoot apex: Intact (%) | Shoot apex: Removed (%) |
|---|---|---|---|
| 0 | 0 | 0 | 100 |
| 250 | 1 | 0a[y] | 100 |
| 250 | 2 | 8ab | 100 |
| 250 | 3 | 25abc | 100 |
| 250 | 4 | 42c | 100 |
| 500 | 1 | 0a | 100 |
| 500 | 2 | 8ab | 100 |
| 500 | 3 | 42c | 100 |
| 500 | 4 | 50c | 100 |
| 1000 | 1 | 0a | 100 |
| 1000 | 2 | 8ab | 100 |
| 1000 | 3 | 33bc | 100 |
| 1000 | 4 | 50c | 100 |

[z]12 plants per treatment.

[y]Means separation by Duncan's multiple range test, 5% level.

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# TH 656, a Promising New Material for Thinning 'Wilking' Mandarin Fruit[1]

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*Abstract.* **In fruit thinning experiments performed during the June, 1970 drop period in mandarin (*Citrus reticulata* Blanco cv. Wilking), both 200 and 400 ppm naphthalene acetic acid (NAA), applied 6 days before extremely onset of hot weather, increased fruit size without significantly decreasing yield. Under other conditions, NAA sprays did not cause enough additional fruit drop to thin the crop. In 1972, 400 and 600 ppm NAA proved ineffective. A new thinning agent, 1- (α-naphthaleneacetyl)-3,5 dimethylpyrazole (TH656) applied at 160 ppm, brought about a significant increase in fruit size without decreasing yield.**

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Alternate bearing is characteristic of the 'Wilking' and some other mandarins. Apart from a most undesirable effect of the heavy crop on fruit size, tree vigor and longevity are often reduced. Fertilizing to alleviate decline due to overbearing was found to be effective with 'Murcott' in Florida (13) and has given promise in experiments with 'Wilking' in Israel (A. Golomb and A. Bar-Akiva, unpublished).

NAA has been tried repeatedly as a thinning agent during the fruit drop period in 'Wilking' and 'Kinnow' mandarins (1, 3, 7). While NAA sprays during bloom had no influence on citrus fruit set (11, 12), applications during the period of June drop produced a