

Vegetative Propagation of Three Plants with Commercial Potential, *Averrhoa carambola* L., *Gevuina avellana* Mol., and *Hillia valerii* Standl.

Brent McKenzie

Crop & Food Research Institute, Invermay Agricultural Research Station, P O. Box 50034, Mosgiel, New Zealand

INTRODUCTION

The biodiversity programme has been conducted at Invermay since 1989 (Halloy, 1992). One of the objectives is to introduce a range of new plants into New Zealand agriculture and horticulture, thus decreasing the dependence on a relatively narrow range of plants. The majority of plants has been introduced from areas of South America that correspond geographically and climatically to parts of New Zealand.

Averrhoa and *gevuina* are not new introductions to New Zealand, but their production potential has not been fully evaluated. *Hillia* may be a new introduction to New Zealand. The purpose of this paper is to describe research focused on determining propagation requirements for new plants from the biodiversity programme.

MATERIALS AND METHODS

***Averrhoa carambola* L. Oxalidaceae.** Commonly known as carambola tree, star fruit, or oxalis tree it occurs naturally in Asia with a distribution across the continent from India into southern China. An evergreen tree reaching 5 to 10 m, it has pinnate leaves that close when touched. The pendant, fleshy, ribbed fruit is up to 10 cm long and yellowish brown in color.

Its uses in Asia are well documented (Queensland Department of Primary Industries, 1984). It is grown in tropical regions and parts of the United States, including Hawaii. One accession was tested.

***Gevuina avellana* Mol. Proteaceae.** Commonly known as *gevuina*, Chilean nut and Chile hazel, the indigenous name is *guevin*. *Gevuina* is an attractive evergreen tree from the Valdivian forest in Chile. Tolerant of some frost to -8C, it produces a nut with an edible kernel similar to macadamia and is the source of cosmetic oils. The timber is used for joinery and turnery. It was apparently first introduced into New Zealand in the 1940s. Four accessions were tested.

***Hillia valerii* Standl. Rubiaceae.** A small tree from the cloud forest of Costa Rica with attractive glossy dark green leaves and creamy white flowers similar to plumeria (*frangipani*), it could have potential as a container plant because of the attractive foliage and compact habit. Under glasshouse conditions at Invermay it has not exhibited any pest or disease problems. One accession was tested.

MATERIALS AND METHODS

The facility used for propagation was a structure covered with rigid, twin-skin, polycarbonate material. Concrete benches support heating cables imbedded in sand. Two thermostatically-controlled electric heaters in the ridge provide air heating to a constant 18C. Two domestic fans, one at each end, provide ventilation. An intermittent mist system on each end is controlled by an electronic leaf.

The greenhouse used for growing on and holding the more tender plants is also covered with twin-skin polycarbonate. In winter heat is maintained at a minimum 12C and maximum 18C. Summer minimum and maximum are 17C and 25C.

Accession 63 of *gevuina* was planted outside in the nursery trial site. The remaining stock plants were maintained in containers in the structures described above.

Table 1. *Averrhoa* rooting. Accession 617.

Acc. no.	Cut date	No.	Pot date	No. rooted and (%)	Medium	Cutting type
617	11/2/91	2	6/3/91	1 (50)	—	—
617 2-91/1	10/11/92	4	30/6/93	only 3 with callus	peat/sand	tip, soft-tips out 150 mm
617 7-90/1	10/11/92	6	23/3/93	4 (66)	peat/sand	tip, soft-tips out 150 mm
617 7-90/1	14/1/92	9	23/3/93	1 (11)	peat/perlite	tip, semi-hard wood 150 mm
617 2-91/1	14/1/93	3	23/3/93	3 (100)	peat/perlite	softwood side shoot with hardwood heel 150 mm
617 2-91/2	14/1/93	3	23/3/93	1 (33)	peat/perlite	semi-hard 200 mm
617 7-90/1	31/3/93	7	30/6/93		peat/sand	semi-hard 150 mm
617 2-91/1	31/3/93	6	30/6/93	2 small roots 4 callused	peat/sand	semi-hard 150 mm
617 2-91/2	31/3/93	3	30/6/93	3 small callus	peat/sand	semi-hard with hardwood heel 150 mm

Six-inch (150 mm) tip and basal cuttings of side shoots were taken of *averrhoa*. The basal cutting included part of the main stem. Softwood and semihardwood tip cuttings 6 to 8 in. (150 to 180 mm) long were taken from side shoots of *gevuina*. Leaf-bud cuttings are being tried. Tip cuttings 3 1/4 in. (80 mm) long were taken from side shoots of *hillia*. Cuttings were dipped for 5 sec in 5000 ppm indolebutyric acid (IBA), K⁺ salt formulation and stuck in either 3- or 5 1/2-in. (80- or 140 mm-) rigid plastic pots with bottom drainage, containing a 1 : 1 mix of either 1 peat : 1

horticultural sand or 1 peat : 1 perlite (v/v). Pots were bedded into sand of the cutting bench to ensure heat transmission.

RESULTS AND DISCUSSION

Grafting has been the most common method of propagating *averrhoa* since cutting propagation has been mostly unsuccessful (Campbell, 1970; Tidbury). The completed trials in this study gave an overall success rate of 43% (Table 1). The first entry was work done by Ralph Bungard.

Table 2. *Gevuina* rooting. Accessions 546, 557, 545, 63.

Acc. no.	Cut date	No.	Pot. date	No. (%)	Medium	Comment
63	17/1/91	26	19/3/91	24 (92)	—	—
545	18/1/91	1	5/2/91	1 (100)	—	well rooted
546	18/1/91	1	5/2/91	1 (100)		
63 7-89/1	04/2/92	7	16/5/92	7 (100)	peat/sand	well rooted
557 7-91/1	14/1/93	2	23/3/93	2 (100)	peat/sand	well rooted
557 7-91/6	14/1/93	5	23/3/93	5 (100)	peat/sand	well rooted
63 1-91/4	14/1/93	1	23/3/93	1 (100)	peat/sand	well rooted
63 1-91/19	14/1/93	1	23/3/93	1 (100)	peat/sand	well rooted
557 7-91/6	31/3/93	3	20/5/93	3 (100)	peat/sand	well rooted
557 7-91/1	31/3/93	5	20/5/93	5 (100)	peat/sand	well rooted

Three batches of cuttings are still in the propagation house. Root balls of cuttings that rooted after 50 days were small. Often roots arose from large masses of callus tissue. Removing the callus and resticking the cuttings may have some merit.

Several growers overseas and in New Zealand have reported difficulties with propagating *gevuina* from seed (Halloy, 1992; Queensland Department of Primary Industries, 1984). While germination did occur, 70% or more of the seedlings died at an early stage. Recently obtained seed has been sown individually in separate containers to avoid handling at what may be a critical stage. At a late stage, the application of Aliette (80% fostetyl-aluminum), 5 g/l, at 28-day intervals stopped the sudden collapse and death of plants. R. Appleton, another grower, reported this in personal conversation (1992). Table 2 gives details of cutting information. The first three entries are results of work by Ralph Bungard.

All *gevuina* cuttings rooted in nine of 10 trials and gave transplants with well-developed fibrous root systems. The potted plants were placed into the heated house along with the stock plants and showed no detrimental effect from the

potting disturbance. Number of days from sticking cuttings to potting varies from 18 to 71. Initial rooting occurred within 18 days. Cuttings were left longer to develop more roots, and at 50 days root balls had good root systems and had to be soaked in water to allow easy separation. The 71 days was determined by work load.

Hillia cuttings were all well rooted at 40 days. Work on this species is at the initial stage and more cuttings need to be tested. Rootballs were soaked in water for easy separation when they were potted two months later. Based on these results, I suggest potting at 50 days.

Table 3. *Hillia* rooting.

Acc. no.	Cut date	No.	Pot. date	No. rooted (%)	Medium	Comment
601	14/1/93	8	23/3/93	8 (100)	peat/perlite	excellent root system

CONCLUSION

Averrhoa results indicate that rooting is possible. I believe the trial warrants continuation.

Gevuina rooting was excellent. Performance of cuttings from other accessions will confirm whether or not this result is typical.

Hillia rooted easily, and further trials should confirm this observation.

LITERATURE CITED

- Campbell, C.W.** 1970-71. Minor tropical fruit cultivars in Florida. Proc. Florida Hort. Soc. 83:353-356.
- Endt, D.** 1982. The Chilean wild nut or avellano, A further report. California Macadamia Society Yearbook. Vol. XXVII.
- Halloy, S.R.P.** 1992. El programa de biodiversidad de Nueva Zelanda. Investigacion y conservacion de recursos geneticos sudamericanos. Yungas. 2(3):4-6.
- Queensland Department of Primary Industries.** 1984. Tropical fruit trees for Australia.
- Sanchez, L. and W.B. Storey.** 1970. The Chilean wild nut or avellano. California macadamia society yearbook. Vol XVI.
- Tidbury, G.E.** *Averrhoa* spp. carambola and bilimbi. In: The propagation of tropical fruit trees. R J Garner and S. A. Chaudri (eds.). Commonwealth Agricultural Bureau.