Propagation of *Persoonia* Species by Seeds and Cuttings

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INTRODUCTION

Several species from the genus *Persoonia* have been noted for their horticultural potential (Wrigley and Fagg, 1989), either as a floricultural or an ornamental crop. The genus belongs to the Proteaceae family. There are approximately 72 species of *Persoonia*, all endemic to Australia except *P. toru*, which is found in New Zealand (Closs and Orchard, 1985).

The flowers and foliage of *P. virgata*, a species in south-east Queensland, are currently bush-picked and sold on the domestic market. Being an evergreen shrub that flowers year round, this filler has the potential to supply both the domestic and export markets continuously. However, as the propagation of this species has not been resolved, it cannot be cultivated. This limits the export potential of this product due to the fact that there is no guarantee of continuity of supply, uniformity, or quality of the product.

MATERIALS AND METHODS

Seed Experiment. Drupes of *P. sericea* were collected from Murphy's Creek, southeast Queensland in June 1992. The mesocarp was removed by either fermentation, following the method as described by MacDonald (1986), or acid extraction, using 32% hydrochloric acid (HCl), following the method as described by Crossley et al. (1993). The seed were then stored in plastic bags at ambient temperature.

The following treatments were then applied in February 1993:

Chemical Scarification. This treatment was used to soften the woody endocarp, and thus aid the mechanical scarification process. Treatments used were: sulphuric acid (H_2SO_4) at 98% for 15 min or caustic soda (NaOH) at 5% for 15 min.

Mechanical Scarification. The degree of endocarp removed, using a sharp scalpel, was either:

- Moist fruit—pierced; ends removed; half removed longitudinally; or majority removed;
- Dry fruit—half removed longitudinally; or
- Moist fruit—none removed (control).

The experiment was a 2 × 2 × 6 factorial, with three replications and four fruit per replication. A completely randomised layout was used. The fruits were cultured aseptically, following a disinfestation process. This involved the scarified seeds being soaked in an airtight vessel containing an aqueous solution of sodium hypochlorite (2000 ppm chlorine) for 20 min, with regular shaking. The culture medium used was de Fossard's (1981) Holding Medium at half strength, with 10

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ml placed in glass jars. The cultures were placed in a growth chamber with a 16 h photoperiod, and at a constant temperature of 25C. Visible protrusion of the radicle or cotyledons was used as the parameter to determine germination. Fruit were assessed three times weekly for up to 100 days after culturing.

Cutting Experiment. Young, vegetative, tip growth of *P. virgata*, which had slightly firmed, was collected in the morning from State Forest 959, Gympie district in southeast Queensland in June 1993. The plant material was trimmed to tip cuttings approximately 10 cm in length, and rinsed for 10 min in sodium hypochlorite (600 ppm chlorine), followed by a final rinse in tap water. The treatments tested were:

Hormone Treatments. These were applied as 5-sec, basal quick dips, using combinations of the auxin, IBA, and the cytokinin, benzylaminopurine (BAP), dissolved in 80% ethanol. The cuttings were trimmed at the base and the basal third of the leaves removed prior to dipping, with excess solution allowed to evaporate before planting. Hormone concentrations and combinations used were:

1) Control (80% ethanol)
2) 2 ppm BAP
3) 4 ppm BAP
4) 2000 ppm IBA
5) 2000 ppm IBA / 2 ppm BAP
6) 2000 ppm IBA / 4 ppm BAP
7) 4000 ppm IBA
8) 4000 ppm IBA / 2 ppm BAP
9) 4000 ppm IBA / 4 ppm BAP
10) 8000 ppm IBA
11) 8000 ppm IBA / 2 ppm BAP
12) 8000 ppm IBA / 4 ppm BAP

Propagation Media.

1) Oasis® Wedge® growing medium;
2) Growool® blocks; or
3) 1 peat : 1 perlite : 1 vermiculite (by volume) in jiffy peat pots.

Oasis® growing media are rigid, open-celled, water-absorbing foams that are recommended to be always kept moist (Smithers-Oasis, sales brochure). Growool® is a rockwool product, that provides a fairly wet medium with low air porosity (Peate, 1989). However, Peate further explains that when used in fogging propagation systems, the media will not be as wet as when used in a misting system.

The experiment was a 12 × 3 factorial, with five replications and eight cuttings per replication. A completely randomised layout was used. The cuttings were placed in a propagation house, with bench heating at 25C, and humidity maintained at 86% by a fogging system. The cuttings were manually irrigated daily.

During the twelfth week of the experiment, the cuttings were assessed for callus or root development. Any unrooted, live cuttings were recut and retreated with the hormone being tested before being placed back into the propagation environment with fresh medium. These were finally assessed after a further 12 weeks. Callus production was rated on a scale from : 1—no callus, to 4—large callus.

RESULTS AND DISCUSSION

Seed Experiment. The seed experiment described in this paper shows that fermenting the fruit of *P. sericea* and then removing half of the endocarp longitudinally from moist fruit will maximise seed germination in an aseptic environment.

The method of fruit removal had a significant effect ($P<0.01$) on germination, with no germination resulting from fruit removal using 32% HCl, while some fruit which had been fermented germinated. The reason for this result is unknown and

requires further investigation.

Minimal or no mechanical scarification inhibited germination, possibly due to the hard woody barrier restricting embryo development or limiting oxygen availability to the embryo. However, germination was significantly increased ($P<0.01$) when the endocarp was half removed longitudinally from moist fruit. Germination of seed which had almost all of the endocarp removed was significantly lower ($P<0.01$) than when the endocarp was half removed from moist fruit. The lack of germination from these seed may be a result of the embryo being damaged during the removal procedure, or the endocarp may have a role in the regulation of seed imbibition.

Neither chemical used for scarification had a significant effect ($P>0.05$) on the germination of the fermented fruit. As illustrated in Fig. 1, with the three endocarp treatments having a germination response, each chemical contributed to approximately half of the total germination percentage. Even though the chemical scarification treatment appears to have no direct effect on the germination response of this species, it did make the endocarp easier to remove, as did the moist fruit compared to the dried fruit.

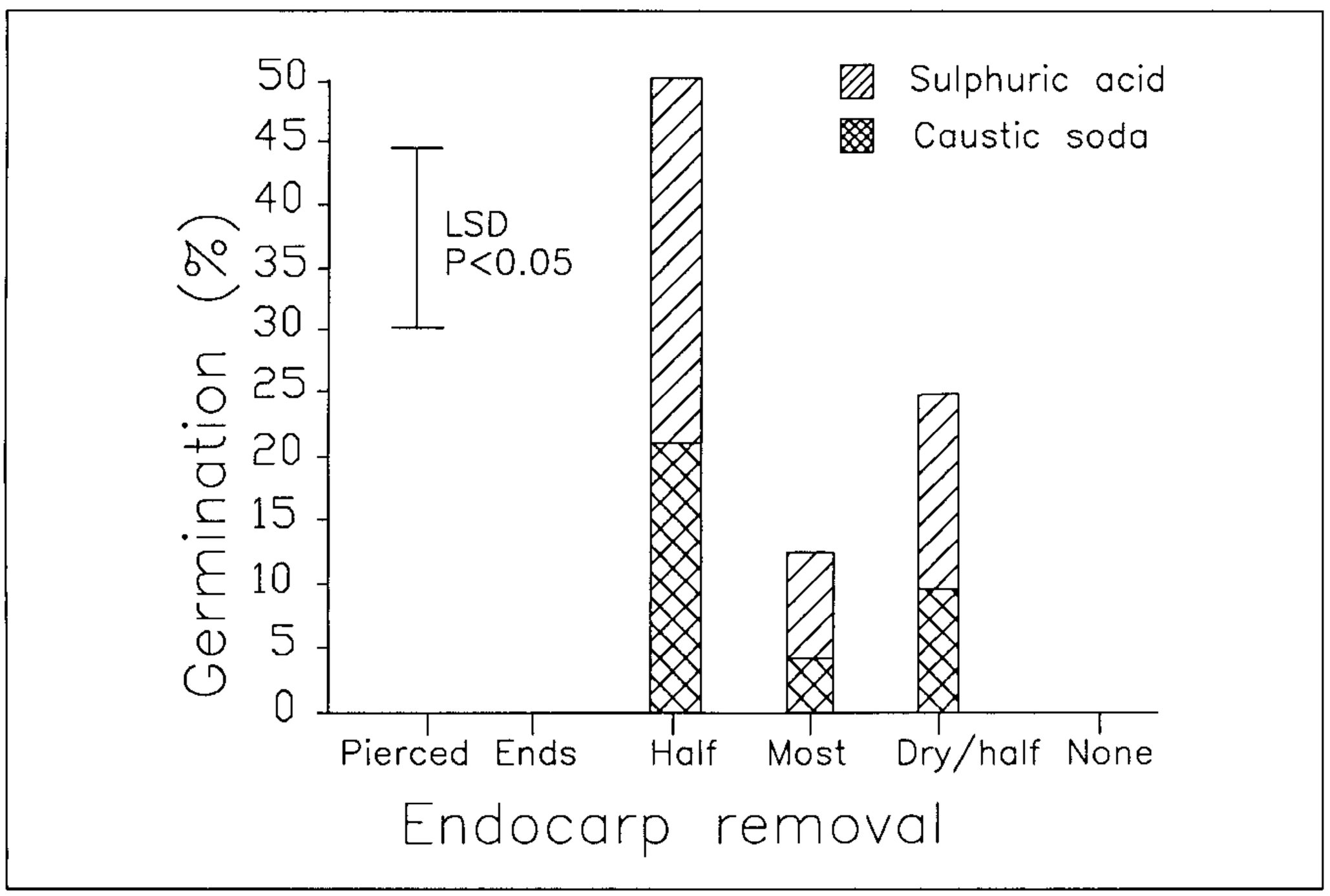

Figure 1. Effect of scarification treatment and endocarp removal on the germination percentage of fermented *Persoonia sericea* seed.

Cutting Experiment. Hormone treatment influenced cutting survival. A significantly greater ($P<0.01$) number of cuttings died when treated with a hormone containing 8000 ppm IBA, when compared to the control (Table 1). This result was consistent with both harvests, suggesting that a toxicity effect was occurring from such a high concentration of IBA.

The effect of the hormone treatments on callus production was not significantly different ($P>0.05$) at either harvest periods, when compared to the control (Table 1). Further investigations are required with the hormone treatment, allowing for comparisons of higher concentrations of BAP.

The Growool® medium was demonstrated to be the superior medium in this experiment. It produced a significantly lower ($P<0.01$) number of dead cuttings, and a significantly higher ($P<0.01$) callus rate, than the other two media, as indicated in Table 2. This result was consistent for both harvest periods. The use of a fogging propagation system allowed the Growool® medium to be less moist than the peat mixture, with the Oasis® blocks being too dry for an optimum rooting response. The physical properties had a direct effect on the callus production and death of the cuttings, suggesting that for a fogging propagation system, Growool® should be used for *P. virgata*.

Table 1. Comparison between number of dead cuttings and between callus rate of a control and each of the hormone treatments of *P. virgata* cuttings at 12 and 24 weeks.

	Harvest (weeks)		Harvest (weeks)	
	12	24	12	24
Hormone treatment	Number of dead cuttings		Callus rate	
Control	0.27	0.47	1.79	2.32
2 ppm BAP	0.33	0.87	1.73	2.07
4 ppm BAP	0.53	0.93	1.71	2.13
2000 ppm IBA	0.33	0.80	2.14	2.41
2000 ppm IBA/2 ppm BAP	0.47	1.13	2.02	2.37
2000 ppm IBA/4 ppm BAP	1.00	1.80	1.77	2.22
4000 ppm IBA	1.40	2.00	1.60	2.10
4000 ppm IBA/2 ppm BAP	0.40	0.67	2.12	2.59
4000 ppm IBA/4 ppm BAP	0.53	0.73	2.07	2.44
8000 ppm IBA	2.73	3.60	1.59	2.17
8000 ppm IBA/2 ppm BAP	2.27	3.07	1.60	2.48
8000 ppm IBA/4 ppm BAP	1.73	2.20	1.83	2.21
$LSD_{0\,05}$	0.99	1.26	NS	NS
$LSD_{0\,01}$	1.30	1.65		

Little rooting occurred in this experiment. However, of the rooted cuttings, the majority were treated with the hormone 4000 ppm IBA/4 ppm BAP and were planted in the Growool® medium.

Table 2. Comparison between number of dead cuttings and between callus rate of the media treatments of *P. virgata* cuttings at 12 and 24 weeks.

Media treatment	Harvest (weeks)		Harvest (weeks)	
	12	24	12	24
	Number of dead cuttings		Callus rate	
Oasis®	1.40	1.98	1.70	2.19
Growool®	0.22	0.43	2.05	2.66
Peat/perlite/vermiculite	1.38	2.15	1.75	2.02
$LSD_{0\ 05}$	0.53	0.65	0.19	0.20
$LSD_{0\ 01}$	0.69	0.85	0.25	0.27

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