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Cloning and Selection of banksias

Margaret Sedgley
Department of Horticulture, Viticulture and Oenology
Waite Agricultural Research Institute
The University of Adelaide
Glen Osmond
SA 5154

Introduction

Cloning and selection of banksias are essential for improvement of yield and quality. It is important to select plants which are consistently superior over a number of years. These should then be propagated by vegetative means, so as to perpetuate their superior characteristics. Potential methods for vegetative propagation of banksias are cuttings, tissue culture and grafting.

Cuttings

We have been experimenting with cutting propagation of banksias for a number of years. We were guided by Gail Barth, who found that *Banksia coccinea* would root with any concentration of indole butyric acid (IBA), but that high concentrations in the order of 10,000 ppm were most effective. We have tested a range of concentrations of IBA on glasshouse grown mother plants of *Banksia coccinea*, and also on field grown material of *B. coccinea*, *B. menziesii*, *B. hookeriana* and *B. prionotes*.

Our cutting technique is as follows. New flush growth was selected after it had started to harden, generally between May and August. Terminal and sub terminal cuttings were taken of approximately 10 cm length. Half of the leaves were removed from the cutting, and the remainder of the leaves were cut in half. The base of the propagule was recut under water, and wounded by two longitudinal cuts of 1.5 cm length. The base of each cutting was held in IBA

solution for five seconds. Each cutting was placed in an individual 5 cm diameter tube with equal volumes of peat, coarse sand and perlite, in an uncovered mist propagator with 25°C bottom heat, with misting for five seconds every ten minutes. The mist propagator was housed in a three metre square glass-walled compartment of a glasshouse set at 18°C the glasshouse had whitewash on the roof between October and April.

In the experiment with glasshouse grown mother plants of *Banksia coccinea*, the plants had been in the glasshouse for two years, and had been watered and fertilised regularly. These plants were in ideal condition. One reason which has been proposed for the poor rooting of woody plants, is the presence of phenolics which may interfere with the rooting process. To test this, some cuttings were treated with an anti-phenolic treatment which comprised soaking the cuttings for 5 hours in a mixture of 1 g/l ascorbic acid and 1.5 g/l citric acid prior to IBA treatment. The experiment was set up as shown in Table 1.

Table 1. Treatments applied to cuttings taken from glasshouse grown mother plants of three plants of *Banksia coccinea*

Treatments (ppm IBA)	Number of cuttings		
	Plant 1	Plant 2	Plant 3
0	8	8	8
1,000	8	8	8
5,000	8	8	8
10,000	8	8	8
Anti-polyphenolic treatment			
0	8	8	4
1,000	8	8	0
5,000	8	8	7
10,000	8	8	0

The first roots started to appear after one month, but maximum rooting success was recorded at 6.5 months. In order to reduce root damage to a minimum, we scored success when the roots grew from the base of the tube. The results are shown in Table 2.

Table 2. Percent rooted cuttings at 6.5 months from glasshouse grown mother plants of three plants of *Banksia coccinea*

Plant	ppm IBA				Average
	0	1,000	5,000	10,000	
1	12.5	37.5	12.5	87.5	37.5
2	25	50	62.5	25	40.6
3	25	0	25	12.5	15.6
Average	20.8	29.2	33.3	41.7	
Anti-polyphenolic treatment					
1	12.5	50	50	50	40.6
2	50	12.5	75	37.5	43.7
3	25	-	14.3	-	19.6
Average	29.2	31.2	46.4	43.7	

As found by Gail Barth, there was a trend toward an increase in rooting with increased IBA concentration. There were also differences between plants in rooting ability. There was a slight increase in rooting following the anti-polyphenolic treatment.

For field grown material, which received less water and fertiliser than in the glasshouse, we found that the high levels of IBA were toxic. The results shown in Table 3 were obtained using 12 ppm IBA, which gave the most consistent results. *Banksia menziesii* was particularly poor in rooting ability, and further work is needed on this species. The variation between different plants in rooting ability is again shown.

Table 3. Rooting of cuttings of field grown material of *Banksia coccinea* and *B. menziesii*

	Species	
	<i>B. coccinea</i>	<i>B. menziesii</i>
Number of cuttings	1000	459
Number with roots	428	56
% success	42.8	12.5
Number of plants	18	11
Number with roots	17	7
Range of % success	0 - 85	0 - 20

Similar results to those for *Banksia coccinea* were obtained for *B. hookeriana* and *B. prionotes*.

Paul Hoskyns and Sophie Bickford assisted with this work

Tissue culture

This work was conducted by a postgraduate student Kim Tynan, under joint supervision with me and Dr. Eileen Scott. *Banksia coccinea* and *B. spinulosa* var. *collina* were successfully multiplied *in vitro* for the first time using nodal segments from 6 - 12 month old seedlings. A modified half strength Murashige and Skoog medium with 2.2 μ M benzyladenine and 0.05 μ M IBA supported multiplication of both species. Shoots of *Banksia coccinea* were rooted *in vitro* using IBA or naphthalene acetic acid, but the plantlets could not be weaned successfully from the culture flask to the glasshouse.

Grafting

Some work on grafting has been done by Gail Barth and by members of the Banksia Study Group. So far, the results have not been taken to commercialisation. We have not conducted any work as yet, but one of my postgraduate students, Raelene Mibus-Teuwsen, is planning to conduct some experiments in the near future.

Selection

We have made a number of selections of *Banksia*, and three cultivars have been registered with the Plant Breeders Rights Office in Canberra. These are Waite Orange, Waite Crimson and Waite Flame.

Waite Orange is an orange hybrid banksia for cut flower production. The parents are *Banksia hookeriana* and *B. prionotes*. Flowering time is in May, which is intermediate between the peak flowering time in South Australia of *Banksia prionotes* in March and *Banksia hookeriana* in July.

Waite Crimson is a late spring-flowering selection of *Banksia coccinea* for cut flower production. The colour of the inflorescence is crimson, and the peak flowering time is October.

Waite Flame is an early spring-flowering selection of *Banksia coccinea* for cut flower production. The colour of the inflorescence is flame, and the peak flowering time is July/August.

Conclusions

The goal of clonal plantings of banksias is now much closer. Superior selections have been made, with many more ready for commercialisation. There are a number of areas where further work is required. *Banksia menziesii* was particularly poor in rooting ability via cuttings, and further work is needed on this species which has many interesting colour variants. Further work to acclimatise rooted plantlets from tissue culture could also lead to major advances for the industry.

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