

EXPERIMENTAL TECHNIQUES USED IN BANKSIA GRAFTING

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Abstract Methods that have been successfully used to graft West Australian *Banksia* to East Australian *Banksia* rootstocks are described. Results of trials carried out at different times of the year using different stock/scion species combinations are given. The behaviour of the different stocks and direction in which further work is proceeding is indicated.

MATERIALS AND METHODS

The approach graft technique as described by Pryor & Willing (2) was used in the early stages of this study.

Razor blades are used in preparing all cuttings; 10 mm P.V.C. budding tape is used to bind the grafts. It is split lengthwise to give a 5 mm width for small diameter grafts. No wax is used. Where possible the graft union is made 4-8 cm above the base of the stock plant with firm green stems 2-5 mm in diameter. Grafts are held in a cold frame during their first winter or until new scion growth has commenced. No artificial heating is used.

Four different grafting techniques have been tried:

1. Approach grafting is carried out using the whip and tongue union. Plants are grown near the rim of individual pots to enable plants to be matched according to the diameter and firmness of the stem. Also, being separate, either plant can be raised to enable union at leaf nodes. Cuts 1, 2 and 3 (Figure 6) are made to produce matching tongues which are held together and bound firmly; 6 to 12 weeks after joining, the top is cut off the stock plant (cut 4) and the bottom is cut off the scion plant (cut 5). If the scion still appears healthy after another week, the tape is removed.
2. Wedge grafting is carried out carefully so that the closest possible match of cambium tissue is achieved. A vee section is removed from the stock which is continued down into a vertical cut to a depth of about 2 cm. Shoulders are cut on the scion to match the top segment shaped sections of the stock (Fig. 2). These help to achieve a closer match of cambium around the entire stem.
3. Grafted-cutting. The wedge grafting technique is used as explained above. The bound stock/scion combination, totalling 15-20 cm in length, is treated as a cutting until roots have been formed. The scion used may involve 1-3 leaf nodes.

4 Budding is carried out using the T-budding technique.

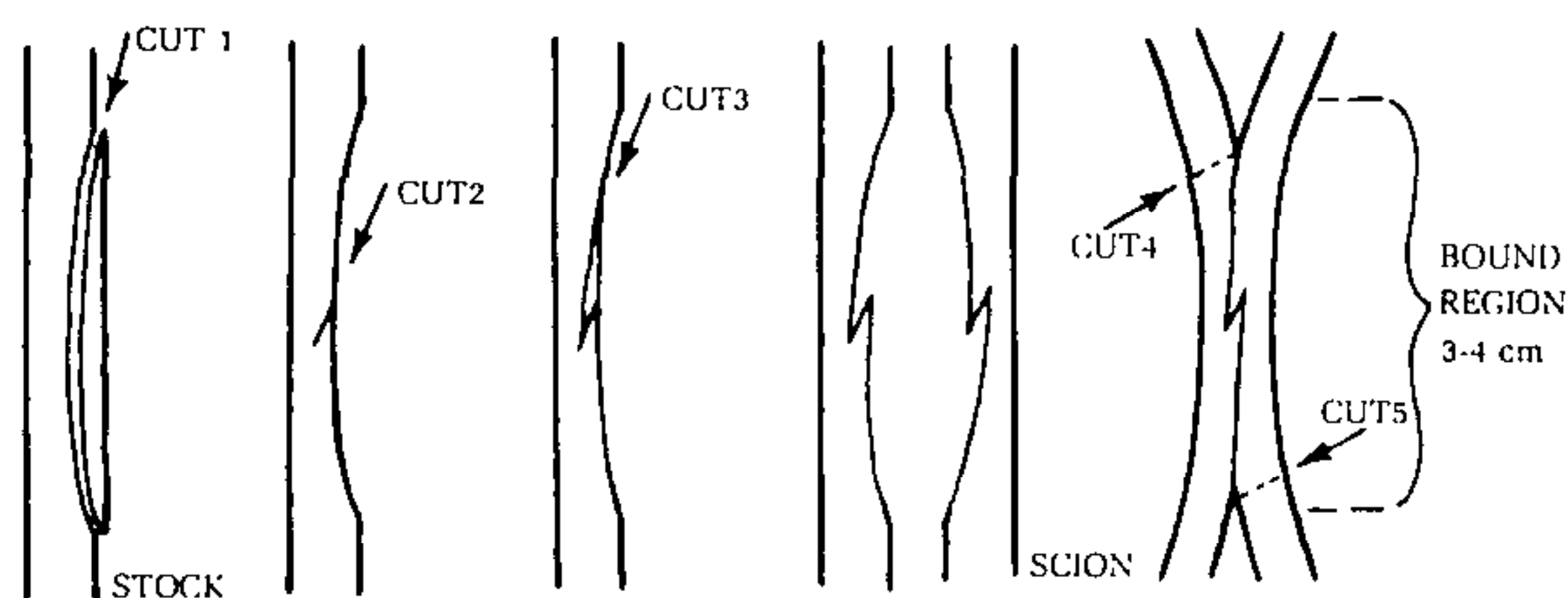


Figure 1. Method of making approach graft.

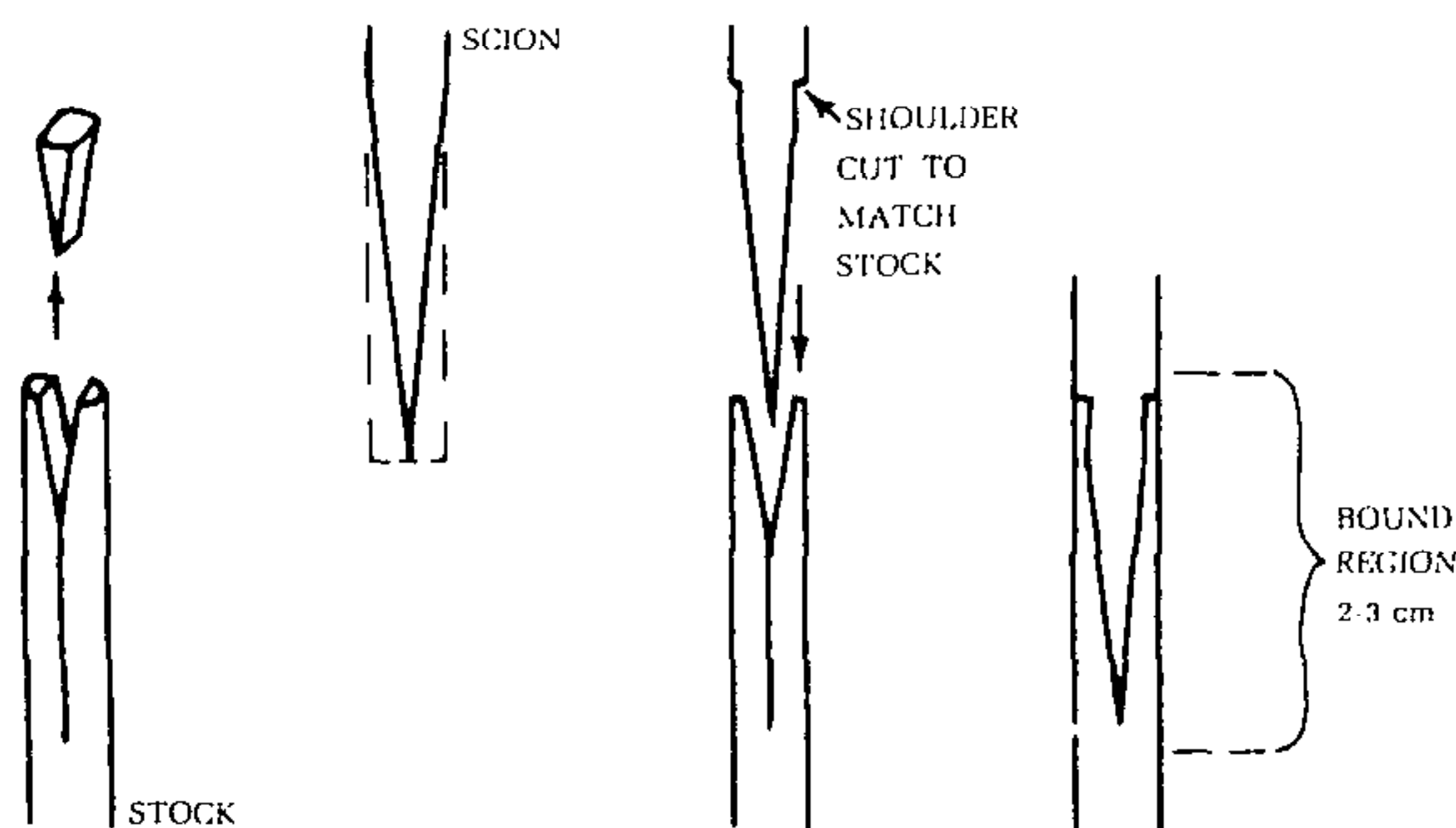


Figure 2. Method of making wedge graft.

RESULTS

Nomenclature follows that of Holliday & Watton (1).

Table 1. Results of approach grafts using as stock: *Banksia ericifolia* L.f.

Scion	Number attempted	Month	Age (Months)	Comments
<i>B. brownii</i> Baxter	1	Nov	2	Scion plant died before cut 5
<i>B. coccinea</i> R. Br.	1	Nov	—	Scion wilted & died within 2 days of cut 5
<i>B. laricina</i> C. A. Gardn.	2	Nov	10	Healthy
		Mar	6	Healthy
<i>B. meisneri</i> Lehm.	1	Mar	2½	Scion died after cut 5
<i>B. nutans</i> R. Br.	1	Oct	23	Healthy
	2	Oct	11	Healthy
<i>B. quercifolia</i> R. Br.	1	Oct	4	Scion died slowly after cut 5
<i>B. sphaerocarpa</i> R. Br.	2	Mar	6	Healthy
		Mar	2½	Scion died slowly after cut 5

Table 1. continuedResults of approach grafts using as stock: *Banksia integrifolia* L.f.

<i>B. ashbyi</i> E. G. Baker	1	Oct	6	Union very good-graft broken by accident
<i>B. coccinea</i> R. Br.	1	Nov	10	Healthy
<i>B. menziesii</i> R. Br.	2	Aug	3	Scion died slowly after cut 5
		Nov	2½	Scion died slowly after cut 5
<i>B. prionotes</i> Lindl.	1	Nov	2	Scion died slowly after cut 5
<i>B. quercifolia</i> R. Br.	1	Oct	4	Died slowly - little callus formed
<i>B. sceptrum</i> Meisn.	1	Oct	1	Scion plant died
<i>B. speciosa</i> R. Br.	1	Oct	23	Healthy - flowered at 18 months

Results of approach grafts using as stock: *Banksia robur* Cav.

<i>B. ashbyi</i> E. G. Baker	1	Feb		Scion died before cut 5
<i>B. brownii</i> Baxter	1	Jan	4	Scion died - new shoots at base of stock
	2	Dec	1	Scion plant died
<i>B. hookerana</i> Meisn.	1	Jan	5	Scion died - new shoots at base of stock
<i>B. lemanniana</i> Meisn.	1	Jan	6	Scion died - new shoots at base of stock
<i>B. menziesii</i> R. Br.	1	Feb		Scion died 1 week after grafting
<i>B. quercifolia</i> R. Br.	1	Mar	3	Scion died after cut 5
<i>B. speciosa</i> R. Br.	1	Jan	2½	Scion died within 3 days of cut 5

Results of approach grafts using as stock: *Banksia serrata* L.f.

Scion	Number attempted	Month	Age (Months)	Comments
<i>B. menziesii</i> R. Br.	2	Mar	—	Scions died within 2 weeks of grafting
	1	Sep	3½	Scion died after cut 5
	1	Jan	—	Scion plant died
<i>B. prionotes</i> Lindl.	2	Mar	2	Scions died after cut 5
	1	Oct	2	Scion died after cut 5 - little callus formed
	1	Nov	10	Healthy
<i>B. sceptrum</i> Meisn.	1	Jan	21	Healthy but stock continues to produce new shoots at base
<i>B. speciosa</i> R. Br.	1	Jan	3	Scion died slowly after cut 5
	1	Feb	2	Scion died slowly after cut 5

Results of approach grafts using as stock: *Banksia spinulosa* (*cunninghamii*)

<i>B. Ashbyi</i> E. G. Baker	3	Aug	24	Healthy
		Apr	17	Healthy
		Sep	12	Healthy
<i>B. brownii</i> Baxter	1	Dec	33	Healthy, 2m high

Table 1. continued

	6	Jan	—	Scion plant died 3 weeks after grafting
<i>B. burdettii</i> E. G. Baker	1	Aug	14	Whole graft died - soil very dry
<i>B. caleyi</i> R. Br.	1	Sep	12	Healthy
<i>B. coccinea</i> R. Br.	4	Aug, Oct, Nov, Mar	—	All scions began to deteriorate with 3 days of cut 5
<i>B. hookerana</i> Meisn.	1	Jan	1	Scion plant died
<i>B. lemanniana</i> Meisn.	1	Mar	30	Healthy
<i>B. menziesii</i> R. Br.	1	Jan	—	Scion died 2 weeks after grafting
<i>B. nutans</i> R. Br.	1	Mar	8	Died in garden - soil dry
<i>B. occidentalis</i> R. Br.	2	Mar	18	Both healthy
	1	Mar	12	Stock died
<i>B. querifolia</i> R. Br.	1	Apr	5	Stock died
<i>B. sceptrum</i> Meisn.	1	Jan	3	Scion wilted within 1 hour of cut 5 - subsequently died
<i>B. speciosa</i> R. Br.	1	Aug	2½	Scion slowly turned yellow after cut 5 - compatibility doubtful
<i>B. sphaerocarpa</i> R. Br.	1	Sep	3	Scion died after cut 5

Table 2. Results of wedge grafts using as stock: *Banksia asplenifolia* Salisb.

Scion	Number attempted	Month	Age (Months)	Comments
<i>B. brownii</i> Baxter	1	Apr		Tip of scion in graft 1 cm below cotyledon level - stock died in both cases
<i>B. praemorsa</i> Andr.	1	Mar		

Results of wedge grafts using as stock: *Banksia ericifolia* L.f.

<i>B. brownii</i> Baxter	1	Mar	6	Healthy
<i>B. laricina</i> C. A. Gardn.	1	Mar	6	Healthy
<i>B. nutans</i> R. Br.	1	Mar	6	Healthy
<i>B. occidentalis</i> R. Br.	1	Jan	2	Scion died
<i>B. sphaerocarpa</i> R. Br.	1	Mar	6	Healthy
<i>B. sphaerocarpa</i> var <i>pinifolia</i>	1	Mar	6	Healthy

Results of wedge grafts using as stock: *Banksia integrifolia* L.f.

<i>B. baueri</i> R. Br.	1	Mar	6	Healthy
<i>B. brownii</i> Baxter	1	Mar	6	Healthy
<i>B. laevigata</i> Meisn. ssp <i>laevigata</i>	1	Mar	6	Healthy
<i>B. media</i> R. Br.	1	Mar	6	Healthy
<i>B. meisneri</i> Lehm.	1	Aug	2	Scion died
<i>B. pilostylis</i> C. A. Gardn.	1	Mar	6	Healthy
<i>B. praemorsa</i> Andr.	1	Mar	6	Healthy
<i>B. sceptrum</i> Meisn.	1	Mar	6	Healthy
<i>B. speciosa</i> R. Br.	1	Jan	6	Scion died - stock tended to come away from scion - possibly tape removed too soon

Table 2. continued

<i>B. verticillata</i> R. Br.	1	Mar	6	Healthy
Results of wedge grafts using as stock: <i>Banksia marginata</i> Cav.				
<i>B. brownii</i> Baxter	1	Jan	9	Healthy
	2	Mar	6	Healthy
<i>B. praemorsa</i> Andr.	1	Mar	6	Healthy
Results of wedge grafts using as stock: <i>Banksia robur</i> Cav.				
<i>B. brownii</i> Baxter	1	Apr	1½	Tip of scion 1 cm below cotyledons - stock died
<i>B. lemanniana</i> Meisn.	1	Mar	3	Scion died
Results of wedge grafts using as stock: <i>Banksia spinulosa (cunninghamii)</i>				
<i>B. ashbyi</i> E. G. Baker	1	Nov	2	Scion died
	2	Mar	6	Healthy
<i>B. brownii</i> Baxter	11	Dec, Jan	8	5 healthy - scion died on 4 - stock died on 2
<i>B. lemanniana</i> Meisn.	5	Dec, Jan, Mar		Scion died in each case after 3-4 months
<i>B. meisneri</i> Lehm.	1	Aug	1	Scion died

Table 3. Results of grafted-cutting trials using as stock: *Banksia spinulosa (B. cunninghamii)*

Scion	Number Attempted	Month	Age (Months)	Comments
<i>B. brownii</i> Baxter	3	Nov	—	Scions died
	2	Mar	6	Healthy
<i>B. occidentalis</i> R. Br.	1	Mar	6	Healthy
<i>B. lemanniana</i> Meisn.	1	Nov	—	Scion died
	1	Mar	—	Scion died

Results of grafted-cutting trial using as stock: *Banksia ericifolia* L.f.

<i>B. nutans</i> R. Br.	1	Mar	6	Healthy
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Table 4. Results of T-budding trial using as stock: *Banksia spinulosa (B. cunninghamii)*

Bud	Number attempted	Month	Age (Months)	Comments
<i>B. brownii</i> Baxter	4	Mar	6	All healthy

DISCUSSION

Trials to date have been restricted to times of the year when outdoor growth conditions, and therefore cambial activity, are optimal in Melbourne, Victoria. The overall results indicate clearly that West Australian *Banksia* can be grafted to East Australian *Banksia* rootstocks by the techniques used.

The approach graft technique used has not proved completely reliable (Table 1). Failures and successes occurred between the same species combinations, although most of the failures were

possibly due to unfavourable weather (i.e. five consecutive days over 33°C in January, 1974).

No success has been achieved to date in grafting *B. menziesii*. The wedge grafting technique is much more productive and economical, and has proved most successful, particularly with species combinations that were successful in approach grafting. The results of *B. brownii* on *B. spinulosa* grafts (Table 2) may indicate the need for the establishment of compatible clones to achieve more reliable grafting.

Wedge grafts were attempted partly below the cotyledon level on the stock (Table 2) in an endeavour to overcome the problem of shoot formation from the lignotuber. However, this resulted in death of the stock within two weeks. The success of the grafted-cutting trials (Table 3) should, following development of suitable clones, prove to be adaptable to commercial use. Such clones are currently being established.

The success of T-budding (Table 4) may also be of commercial interest.

B. ericifolia promises to be a suitable rootstock for *B. nutans*, *B. laricina* and the *B. sphaerocarpa* group. It may also be suitable for *B. brownii*, although producing a less vigorous product than other stocks. The tendency to form a large callus at the graft union is not as great as that in *B. integrifolia* and *B. spinulosa*.

B. integrifolia, *B. marginata* and *B. spinulosa* all promise to be useful stocks with little tendency to shoot below the union. *B. brownii* has grafted readily to all three, being most vigorous on *B. marginata*.

B. robur appeared suitable as a rootstock for *B. brownii*, *B. hookerana* and *B. lemanniana*. However, shoots were continually produced from the lignotuber, despite regular removal, and the scions slowly dehydrated and died. This problem should not arise if cutting-grown plants, of species that develop lignotubers, are used as stocks instead of seedlings. Further trials are being carried out using cutting-grown plants as stocks.

LITERATURE CITED

1. Holliday I. and G. Watton 1975. *A Field Guide to Banksias*. Rigby.
2. Pryor L. D. and R. R. Willing 1963. The red flowering gum. *Australian Plants* 2:35-37.

QUESTIONS

In response to questions Colin stated that he had not specifically tested the practice of chilling scion material as an aid in grafting but that he had collected material from a distance and stored it cold for up to three days before making successful grafts. Ian Tolley pointed out that incompatible lines can become compatible if the height of the union is varied.