initiation and development. This appears not to be a major factor in rooting stevia cuttings with additional stem length and therefore leaf area having no effect on the root score.

For the purpose of bulking up large numbers of plants, single node tip cuttings collected before flower initiation should be used.

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PERSIMMON PROPAGATION: RESEARCH HIGHLIGHTS FROM RUAKURA

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The recent upsurge of interest in persimmons *(Diospyrus kaki)*, particularly the non-astringent or "sweet" persimmons, has resulted in an increased demand for plants. Persimmon plantings have increased from 3,000 trees (about 4 ha) in 1981 to 200,000 trees (350 to 400 ha) in 1984 (2). Size of commercial plantings range from small units of 0.5 ha to areas of 10 to 15 ha. In 1985 a further 60,000 trees were planted (2).

Demand for plants of preferred cultivars has far exceeded supply and this situation is likely to continue for at least the next 2 to 3 years. Consequently, plant prices will remain high — presently, grafted plants sell for $NZ10-15. Persimmon rootstocks sell for $NZ3-5.

At conventional plant spacing of 5 × 5 metres, 400 trees per hectare are required. Consequently, for orchard establishment plant cost alone is up to $NZ5,000. With inflated land values, high establishment costs, and high debt servicing costs there is increasing pressure for intending persimmon growers to implement systems for maximising early production and returns. Closer plant spacings, particularly within a row, are becoming more popular so plant costs of $NZ8,000 to 10,000 are common.

Persimmon propagation research at Ruakura Soil and Plant Station began in 1982. Our initial involvement was stimulated by the need to quickly produce plants of non-astringent cultivars for management trials at other MAF research stations in the Northern Region. Plants were not readily available commercially, scion wood was in limited supply, and grafting success was reported to be very unreliable for persimmon.

Preliminary results were sufficiently encouraging for us to carry out a systematic evaluation of our grafting options for the next season. Our objectives were to:

1. Maximise possible plant numbers from limited scion material.
2. Standardise a procedure which would provide consistent grafting success

In meeting these objectives we considered:

1. Graft-timing and conditions
2. Summer green-grafting
3. Field grafting
4. Propagation of rootstocks

ROOTSTOCKS

Seedling *Diospyrus kaki* rootstocks were used for all grafts. These were grown from imported Japanese seed, which was sown directly, without stratification. Locally collected seed requires stratification and should be stored in a moist environment at 0 to 4°C for 60 to 90 days (1).

SPRING GRAFTING UNDER GLASS

Reports of variable grafting success had been interpreted in some industry circles to reflect the time grafts were made. To investigate this aspect we grafted seedling rootstocks in the glasshouse at monthly intervals from spring through autumn (September to April).

For spring grafts, one-year-old potted rootstocks were forced into early growth in a glasshouse prior to grafting.

Stored scions of 'Tauranga Fuyu', collected in late July, were grafted when the first leaves on the stocks were well-formed. Simple cleft-grafts were made with one or two-bud scions; two bud scions were most successful when wood was less than 1 cm diameter. The exposed scion end was covered with a smear of pruning paste, the union taped and covered with a plastic bag to maintain a humid environment. Under warm conditions (22 to 25°C), callus around the graft union formed quickly and bud burst occurred within 14 days of grafting. The plastic bag was loosened and later removed to gradually acclimate the new grafts. Under these conditions grafting of 'Fuyu' (Tauranga Hospital clone), was almost 100% successful from September through to February using stored scions.

SUMMER GREEN-GRAFTING

In the previous year we had found that it was possible to propagate from current season's growth. The reliability of this method and conditions required to achieve success were examined more precisely.

The spring-grafted plants remained in the glasshouse until early summer (November) to promote shoot growth and were then transferred to a shadehouse. By late summer (January) the new shoots had reached an average length of 55 cm (10 to 16 buds). Growth then slowed and the wood matured. By this time, each spring-grafted plant had produced at least 30 buds considered suitable scion material for green-grafting.

Selected shoots were cut from the spring-grafted plants, leaving two buds to continue growth. Shoots with and without leaves were wrapped in damp newspaper and stored for 7 to 10 days at 4°C to slow wood respiration rate.

Deleafing green-wood scions prior to cool storate was not necessary; however, if cool store space is limited, deleafed scions occupy less space.

On removal from cool storage, two-bud scions were prepared for grafting using the same procedure as for spring-grafted plants — a simple cleft-graft. Grafted plants were left in a glasshouse for five days to promote callus formation, then were moved to a shadehouse.

Although 100% "take" was achieved for green-grafted 'Tauranga Fuyu' in February, March, and April (compared with 90%, 50%, and 60%, respectively, for dormant conserved scions grafted at the same time), bud movment of green-grafted scions was much slower and more uneven than dormant conserved scions (Figure 1). In April, all plants were successfully grafted — these callused well, and the plants became dormant, with bud break occurring the following spring.

Green-wood scions collected in January, surplus to our needs, were grafted after 7 weeks' cool-storage and still gave a 60% successful take.

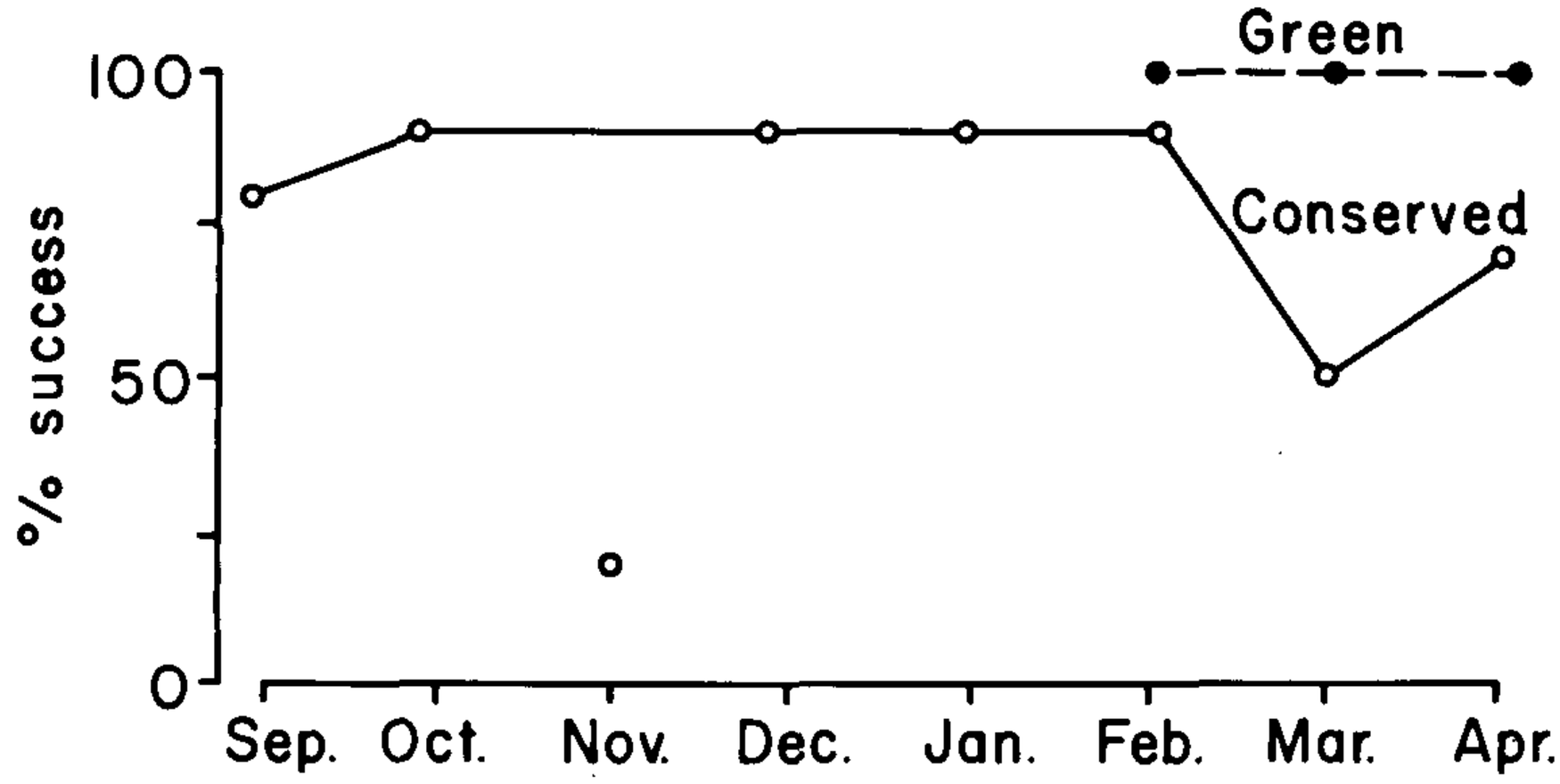

Figure 1. Grafting success of conserved and green scionwood of 'Fuyu' for 1984 season.

A sharp blade and clean cuts are important for grafting current season's growth. Any crushing action will quickly reduce the success rate.

Using this method of forcing spring-grafted container-grown plants and using this early growth for summer green-grafts, it is possible to produce, in one season, enough trees to plant one hectare (5 × 5m plant spacing), from an initial purchase of only 8 to 10 mother plants. This means that almost half the total cost of buying in grafted plants could easily be achieved:

10	mother plants @ $12 each purchased in winter	$120
640	rootstocks @ $4 each "	$2,560
=	100 grafts in spring (assume 90% "take)	
=	force growth for summer green-grafts	
=	assume 12 buds from each suitable for green-grafting	
=	424 plants assuming 60% success rate	
	TOTAL COST:	$2,680

There is potential for even greater savings if growers are able to raise their own rootstocks!

FIELD-GRAFTING

Shelter and irrigation are essential requirements for field-grafting, which should be carried out in late spring when the weather becomes warm. We grafted field-grown stocks on four

occasions at monthly intervals from spring to late summer (October through January). As temperatures increased, success rates for field-grafting increased from 40% in October to 70% in November. We achieved best results for field-grafting in November and December.

Using similar techniques, two Hamilton growers achieved high success rates with field-grafting. One successfully field-grafted in October last year. Another grafted in November two-year-old rootstocks individually sheltered and irrigated, which were about two metres high after one year's growth in the field. Consequently, smaller branches often had to be selected for grafting, rather than the central leader. Grafting continued through to early January using a hand-held grafting device to make a cleft graft. Here it was also found that callusing was much slower and bud break more uneven than for equivalent grafts in a glasshouse. Often, it took a month or longer before bud movement was evident.

Heading back these large field-grown stocks was delayed until the new graft had shoots about 10 cm long. It was considered that the high root pressure from larger stocks would have had deleterious effects on the graft union if they had been headed back at bud burst.

PROPAGATION OF ROOTSTOCKS

Further cost savings are possible if clonal propagation of rootstocks could be achieved. From our work at this stage *D. lotus* softwood cuttings root readily, and results from *D. kaki* are promising. Our interest in clonal rootstocks has been stimulated by recognition of the advantages which could be inferred from an "elite" selection. Between-plant variability would be reduced, and specific characteristics, such as low vigour, selected for and developed. Low vigor or dwarfing stocks could, for example, be used for high density plantings to advantage.

It may be possible to minimize calyx dehiscence or green blotch through rootstock effects.

We anticipate further advances in this area and our propagation programme emphasis has shifted accordingly.

FUTURE DIRECTION

We believe that we do now have the tools to produce plants and produce them quickly. The persimmon industry is at a very early stage of development and there still remains an opportunity to capitalise on improved plant material if it can be identified. There are many clones of 'Fuyu' cultivar being planted and we are trying to type and compare the relative

merits of these as fast as possible. In the meantime everyone in the industry could participate by observing individual tree performance, measuring key parameters which describe vigour, season, yield, quality, and reporting outstanding performers.

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PROPAGATION OF TWO KINDS OF SOUTH AFRICAN BULBS

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Bulb reproduction has mainly been carried out by offsets, seed, and by some vegetative means such as the scooping of hyacinths, the single scales of lilies, and the twin scaling of hippeastrums and daffodils.

Two South African bulbs worthy of a place in most gardens are the lachenalias and nerines.

Lachenalia is a genus comprising over sixty recorded species and is in the Family Liliaceae. It is multiplied by offsets, a means in which it is quite generous. Seed provides an opportunity for plant breeders, as the need for new clones does not appear to have been met in recent times. The current favourite New Zealand hybrid is *L.* 'Pearsonii,' raised in 1922 by Aldridge, curator of Parks and Reserves, Auckland, by crossing *L. bulbiferum* [syn *L. pendula*] with *L. aloides* 'Nelsonii' as seed parent, which was the result of crossing *L. aloides* 'Luteola' and *L. aloides* 'Aurea' in 1882 by Rev. Nelson. It is difficult to find hybrids in commercial trade lists.

A large gene bank of species along with such a range of colours as light blue, sky blue, blue, purple, red, greens, yellows, tricolour and quadricolour, a scent worth enhancing, some attractive spotted foliage, and the ease of growing the black shiny seed, should help the opportunity to become a reality.

Vegetatively propagated bulbils can be produced by leaf cuttings. This is carried out at flowering time when the leaves are firm. They are removed as close as possible to the bulb. A