

CONCLUSION

Although "actual" costs are still to be calculated for Stage 2 of the project we feel that we are stepping in the right direction as far as type of construction and materials used. Even in the relatively short time of 3 years many changes have occurred in the horticultural equipment field. Who knows how Stage 3 will develop?

DESCRIPTION AND PROPAGATION OF THE NEW ZEALAND SOPHORA SPECIES (KOWHAI)

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The Kowhai, pronounced by the Maori, kor-f-eye, means yellow and this is most evident throughout both islands from August to November when plants of this genus burst into flower often on sparsely-leaved branches, according to the species and district. Some overseas visitors have referred to the Kowhai as the New Zealand laburnum while many enthusiasts have proposed that it should be the national flower. The golden, drooping flowers, symbolic of spring, provide abundant nectar and pollen for such visitors as the tui, bellbird, kaka, silver-eyes, bees, butterflies and night-flying moths. No wonder the Kowhai never fails to gain the admiration of the horticulturist or of anyone who appreciates the beauty of nature.

The following descriptions and comparisons within the New Zealand genus should help to clarify some of the uncertainties that may have existed in understanding the Kowhai.

The genus *Sophora* (from *sophera*, an Arabic name for some leguminous trees), is not confined to New Zealand, there being some 38 species scattered throughout Asia, North and South America, the north-east of Africa and Australia, also on islands of the Pacific, Indian and South Atlantic Oceans. The New Zealand species of *Sophora* are not very well defined and

at present there are 3 species, 2 botanical varieties and 1 cultivar.

They are:

- S. microphylla*
- S. microphylla* var. *fulvida*
- S. microphylla* var. *longicarinata*
- S. prostrata*
- S. tetraptera*
- S. tetraptera* 'Gnome'

Undoubtedly in the future other types and forms of interest to the nursery industry will become available from a collection of *Sophora* ecotypes which Dr. E.J. Godley, Director of Botany Division has established at Lincoln.

Sophora microphylla could be termed the common kowhai. It grows to 10 m high and is distributed throughout both islands from near North Cape to Southland and on Chatham Island from sea level to an altitude of 700 m.

It is within this species that so much variation occurs. It has been postulated that this diversity may indicate a relatively recent hybrid origin of this species, the parents probably being *S. tetraptera* and *S. prostrata*. Though today these two species do not occur naturally together, they could well have done so in the past when both the North and South Islands were joined during the glacial period.

The juvenile phase of *S. microphylla*, which has been reported to persist from 10 to 17 years, has been a limiting factor in the extensive propagation by nurserymen of this species from seed. The dense bushy stage with divaricating branches and small leaves could well be the expression of *S. prostrata*'s character in different degrees in *S. microphylla*'s hybrid origin. Besides this juvenility factor *S. microphylla* can be distinguished from *S. tetraptera* in that the former's leaflets are usually less than 10 mm in length, the flowers are generally of a richer colour, the standard being about the same length as the wings and distinctly notched at the tip. Because of its variability *S. microphylla* exhibits a diversity of flowering times in different regions and can be found in full bloom as early as July through to November, depending upon the season. *S. tetraptera* bloom is usually confined to the months of October and November according to district and climate. Finally, *S. microphylla* is considered to have a more robust nature that commends it to the horticulturist.

The two varieties of *Sophora microphylla* (var. *fulvida*) and (var. *longicarinata*) both fail to exhibit the juvenile form found in the species *S. microphylla* and grow straightaway into small trees of 3 m and 4.5 m respectively, making most attractive

trees for the small garden. *Sophora microphylla* var. *fulvida* is found naturally on the coast west of Auckland and in the Wanganui River catchment. It is quite distinct from all other Kowhais, the leaflets being 2 to 4 mm long while the flowers are among the largest of the native sophoras. It is not dissimilar to *S. tetraptera*, the standard being shorter than the wings and the apex entire, or only slightly notched. The flowers have a tendency to hang more or less upside down like those of *S. prostrata* but not so markedly. Flowering is from mid-October till mid-November, 7 to 8 years from seed.

S. microphylla var. *longicarinata* is found naturally in the Takaka district northwest of Nelson, growing in practically pure limestone country. It has leaflets almost as small as *S. prostrata* but has a slender habit which gives a very airy appearance. The flowers are pale yellow in colour 44 mm long, slightly larger than typical *S. microphylla*, and the standard is distinctly erect as compared with other New Zealand sophoras. This variety with its delicate graceful weeping habit could well be grown more widely in the small home garden.

S. prostrata is found between Blenheim and the Waitaki River on the lowlands and hills of the eastern South Island and forms a low rounded hummock bush 1/2 m in height with densely intertangled orange-brown rigid branches. Sparse, hidden flowers are 25 mm long of predominantly orange colour which are usually upside down due to the twisting of the stalk. The leaflets are small and sparse but at no time considered deciduous. In cultivation this species proves to be very hardy and could be used in rockeries and there may be limited use for hedging when more erect forms are selected.

Sophora tetraptera, the east North Island kowhai, wrongly named *S. grandiflora* by some nurserymen, is found naturally from East Cape down through Taihape to the Manawatu Gorge and as far south as Carterton. It is a small to medium-sized tree of approximately 10 m, thriving around forest margins, lakes and rivers from sea level to 450 m. The branches are drooping and spreading. The leaflets differ from all other New Zealand sophora species in that they are larger, being 3 cm long. The large pale yellow flowers produce wings that are longer than the standard, which is entire or only slightly notched at the tip. The species does not have a juvenile form and can be expected to flower in 4 to 5 years.

The only present cultivar in the New Zealand genera of *Sophora tetraptera* is 'Gnome', a deciduous shrub 1 to 2 m tall, which has only been available since 1974 through the nursery trade. Plants, 30 years or more in age, are growing in Christchurch Botanic Gardens and others, 25 years plus, at Otari Plant Museum, Wellington. This cultivar is an erect stiffly branched,

deciduous, bushy shrub with main stems rising in stool formation. There is no divericating juvenile form and plants of two years of age have been known to produce large yellow-tinged green flowers 6 cm long and, like the species *S. tetraptera*, the leaflets are 3 cm long. Flowering of this dwarf kowhai which appears to be tremendously hardy can be enhanced by the removal of the soft terminals of the main stems giving an abundance of flower in the following September and October, making it an ideal shrub for the small garden.

The time-honoured method of propagation of kowhai has been by seed. Some propagators collect the seed when just ripe and sow immediately so that the testa or seed coat has not had time to harden. Others have collected later in the season and soaked the seed in hot water for 24 hours or broken the hard testa by chipping or filing opposite the micropyle. All these methods have been successful except in the case of the cultivar 'Gnome' which appears to have a very soft testa; the hot water treatment destroying germination completely. However, excellent germination can be obtained in 10 days under mist with bottom heat of 25°C.

Vegetative propagation involves no change in the genetic makeup of the new plant with the exception of mutations. Many nurserymen take advantage of this fact when making their selection of stock plants which, in many cases are, or should be clones. Until recently the kowhai has been grown almost entirely from seed. The need for standardization of plant material for sale in New Zealand and for export has made a study of vegetative propagation of this genus most important. Also, the public demand for instant results in the beautification of their home surrounds has placed pressure on the nursery trade to supply predominantly plants which will give a display early in their life.

Sophora microphylla, with its juvenile phase persisting from 10 to 17 years, has been placed in the "cinderella" class by the industry. With this in mind, the Horticultural Research Centre, Levin embarked on a project with the object of obtaining precocious flowering by propagating from adult growth in *Sophora microphylla*. To date we have found that the adult form can be propagated vegetatively from cuttings in mid-November. New growth, 8 to 10 cm long, was taken with the tips nipped out and with a single wound opposite the basal bud. Cuttings were given a Benlate dip (0.5 gms per litre), treated with Seredix No. 2, then inserted into 50/50 peat/pumice mix in a closed frame with mist and bottom heat of 25°C. This gave 100% rooting in 14 weeks. Over a period of 22 months, the plants have just entered their second spring. Growth has averaged 1 m, the plants being well feathered from the base and

approximately 2% have produced flowers. This should substantially increase in the third season. Plants have been staked in their PB3's to encourage upright growth in this initial stage. This may be an important factor when growing *S. microphylla* from adult wood because when naturally grown plants attain their flowering stage they lose the divaricating form and develop a rounded leafy head with branches spreading and drooping from a naked trunk which has been initiated in the juvenile stage. By propagating from adult wood, plants could be of lax drooping habit without a trunk unless staked in the initial stage of growth.

Within this project of vegetative propagation the Research Centre has found that 1 year *S. microphylla* seedlings can be used as stock for chip budding, side and veneer grafts without the reversion of the adult scion wood to the juvenile form. The former chip budding gave only 50% take; this could well be improved with better techniques. This method of vegetative propagation could well be kept in mind, especially where scion material is difficult to obtain. With regard to the remaining 2 species, 2 varieties and 1 cultivar mentioned earlier, these also have responded most favorably to the cutting technique we adapted for *S. microphylla*.

REFERENCES

1. Allan, H.H. 1961: Flora of New Zealand, Vol. 1.
2. Godley, E.J. N.Z. Nature Heritage, Vol. V. Part 65.
3. Hartmann, H.T. and D.E. Kester. 1975: Plant Propagation: Principles and Practices, 3rd ed.
4. Male, R.H. 1970: Journ. Royal N.Z. Inst. Hort. N.S. 2
5. Metcalf, L.J. The Cultivation of New Zealand Trees and Shrubs.