

## Pruning & Staking- Back to basics

In light of the recent work being conducted to draft an Australian standard for tree stock, there has been renewed focus throughout the industry on tree quality. In this month's Nursery Paper NGINA IDO for the Northern Rivers Des Boorman will undertake a back to basics review of the importance, use and techniques of root control, pruning and staking stock for consistent quality production.

## Pruning & Staking- Back to basics

### How do we address this?

#### Root Quality

Root number and structure are fundamental in development of quality plants for all applications, especially when being utilised for growing on into advanced specimens where stability and longevity are crucial to success. A root system that develops in the first few months of a plants' life will be with it for the life of the plant so it is critical to get the first step right. Root remediation can be carried out on small plants such as tubestock at potting-on but this causes significant set-back to the plant and additional costs to the production cycle.

If quality root systems are not produced in the initial stages of production the issue will be compounded throughout the life of the plant if not remediated. Rather than undertake costly remediation conditions should be specified for the production cycle, such as root number and quality.

Root circling and root direction are fundamental when attempting to produce quality stock be they tree, shrub or groundcover so that they will perform post production. Unfortunately due to a range of reasons root quality issues have been broadly ignored or dismissed as a 'luxury' that we can't afford in recent years.

#### Pricking out

There are basic processes such as pricking out seedlings, taproot pruning and the correct technique to insert seedlings into the container to prevent J-rooting that need to be addressed. There are also other issues associated with this such as lateral root development that also compound poor pricking out activities, contributing to the need for root remediation and subsequently staking.

**Direct seeding** is not necessarily the answer either as many seedlings can still develop poor root characteristics when direct seeded into the growing container especially.

Active management of processes and excellent pricking out or tubing technique are the key to success rather than leaving them to their own devices. The first opportunity to grade plants for quality is at the pricking out / tubing stage where defects and poor quality can be rouged out.

Cutting grown stock should also be graded prior to potting and any defects removed from production, it is cheaper to throw out a cutting than a potted plant.

#### Staffing

Staff should be selected on their aptitude and ability to undertake training. Once they have achieved trade level they should be encouraged to regularly undertake additional training to ensure continual improvement of their technical knowledge and maintenance of their skills.

#### Staking Trunks



Flexible rubber tie loosely tied to trunk and secured to wire allow for movement but prevent the tree falling over (Image 1). Of note is the double twist which prevents the tie slipping on the wire.

Tie systems are available that allow the tree to move independently of the trellis which allow for secondary thickening to occur as in image 2, which is the system used at Dooralong Valley Native Plants. (image 2 courtesy of F, Howarth Dooralong Valley Native Plants).



Systems where the stake to support the tree is not anchored into the media also facilitate the development of secondary thickening and is a technique used at Dooralong Valley Native Plants to help produce quality trees (image3)



This is opposed to the following picture Image 4, which demonstrates that poor staking and tying can actually be detrimental to plant performance. In addition poor tying of plants to stakes can also cause failure of the plant and render it unsaleable.



The other focus for quality trees of either clonal or seed origin is to ensure secondary thickening or taper. This is critical as secondary thickening is what gives trees the ability to support themselves and produce healthy trunk characteristics. Secondary thickening is the laying down of lignin (wood) within or between the cell walls in plants as a response to movement of the stem typically from wind. This also has root implications as roots also respond to secondary thickening pressures and compression or tensile strain from the trunk and canopy mass offsetting their growth to compensate for the strain.

In the book Modern arboriculture, Shigo et al 1998 states that 'Conifers form compression wood as a type of reaction wood' & 'In hardwoods cell walls thicken on the upside of the lean; hardwoods have tension wood as a type of reaction wood' (Shigo 1998, pg 63)

This is well documented research and shows the importance of self-support for trees to produce suitable trunk characteristics. He also states that roots react to similar forces of tension and compression changing their profile to more elliptical when exposed to load forces. Depicted in Image 5 (pg 63 Shigo et al 1998), RT shows the centre of a root as being on the lower side of the root indicating additional wood is laid down above the centre to provide the required compression support. Buttress roots are an extreme example of this. The B diagram shows a branch reaction. In both the dot is the centre of the branch/ root.

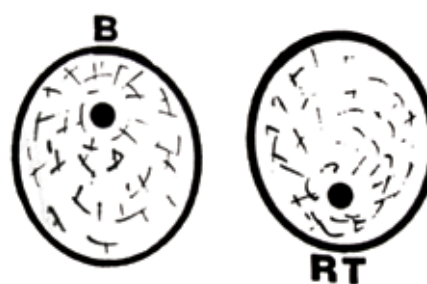


Image 6 depicts a *Eucalyptus tereticornis* trunk base showing definite secondary thickening i.e. broadening towards the base of the trunk compared to an olive tree on the right (Image 7) that has been rigidly tied for too long. Note: consistent trunk calliper top to bottom and an inability for the plant to support top mass. Hence it bends over and would likely snap in adverse wind conditions.

The *E. tereticornis* pictured above (Image 6) is a seedling recruit in a small container, was in heavy shade and not staked yet still produced an exceptionally strong trunk conformation with visible secondary thickening of the base. Conversely the cutting grown olive tree pictured (Image 7) is showing the classic signs of over staking resulting in 'sag' once ties were removed. These two pictures show all too well the differences as highlighted by this section.

Staking has become the default situation rather than as it should be used, on a needs basis. This has developed from the desire to grow plants faster to sell more in any given production period but at the detriment of trunk quality.

Nutrition and growth rates are critical with specific requirements being highly variable between plant types. Generic nutrition regimes and poor understanding of specific nutritional requirements can also exacerbate the issue of secondary thickening



and over-staking due to vigorous growth rates often associated with nutrient imbalances particularly excess nitrogen.

### Pruning

As with any cutting activities hygiene is crucial to ensure success with pruning activities and reduce the likelihood of disease transmission. All tools should be regularly cleaned, serviced and be free of debris.

### Branches

Branching and branch placement is also critical in tree and shrub quality. Branches may develop different crotch angles some of which may be structurally weaker or create bark inclusions that ultimately weaken the trunk. These are also illustrated below so there is a clear understanding of what is acceptable and not. Quite often poor branch or trunk conformation will not fail until 5 or more years post planting when the tree is large and the loss of such a tree will put a significant cost and gap into a landscape.



*Eucalyptus tereticornis* on left (image 8) with open crotch angle and convex branch bark ridge while in the centre (Image 9) is a *Eucalyptus tereticornis* with a highly acute crotch angle and included bark, features that result in significantly weak trunk and branch attachments. The image on the right (Image 10) *Brachychiton* sp. Black Wall Range shows callus already forming in the acute crotch angle and cracking associated with pressure and movement, this trunk while small now, is destined to fail.

Smaller container grown trees often don't have that light competition or 'space' and may produce two or many co-dominant stems with poor trunk confirmation a result.

Obviously this can be a major issue with some tree types having prevalence for branch faults. This prevalence may be due to the growing environment not giving them enough stretch, as in forests or rainforests when a canopy hole is produced by a larger tree falling or being damaged. This acute branch growth while seemingly 'normal' is a symptom of paddock form ie open area growth form that has not been produced in 'normal' competitive successional environments. Examination of these trees will reveal that when exposed to serious stress they may fail like any other tree with poor branch conformation. Typically trees in Sapindaceae are prone to this acute crotch angle, however many grow without failing *Cupaniopsis*, *Harpulia*, *Toechima*, *Diploglottis*, *Guoia* and *Lepiderema* being some of the genera, with *Cupaniopsis* being a significant street tree of warm coastal and sub-coastal situations and an excellent tree adaptable to a diverse range of conditions. (Boorman pers comm. 2014)

Pruning activities should be carried out with knowledge of where

branch collars are and where to cut to ensure that trunk tissue isn't damaged in pruning activities and that a stub isn't left that is likely to promote disease ingress.

The images below demonstrate some of the key points identified with arrows.

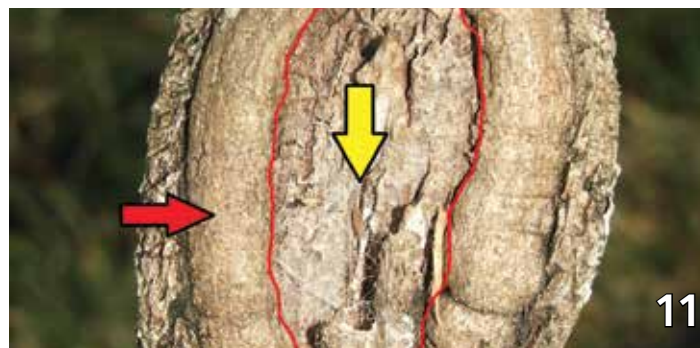


Image 11 depicts trunk defect due to trunk wood exposure from incorrect pruning activities. Of note is the callus tissue around edges but clear dead wood in the centre is already decaying.

Illustrated in Image 12 is a *Brachychiton australis* branch collar where the arrow indicates where to cut the branch.

In Image 13 the arrow indicates a branch abscission scar that is part of the trunk as seen in the previous picture, as a raised collar at the branch base that shrivels and drops out of the trunk post pruning.

A *Tabebuia argentea* branch, with no visible branch collar is depicted in image 14 showing the different expression of branch collars as compared to the *B. australis* above (images 12 & 13).

Branch removal should be perpendicular to the branch where it intersects the trunk on the top side so often a small stub will remain on the bottom side of the cut. This will heal over as a normal part of wound repair.

Pruning methods and amounts need to be stipulated to ensure trees are pruned correctly and not so that it detrimentally affects the canopy size, shape or trunk integrity.

Grafted trees also present some unique issues as graft unions may be unsightly or not be smooth or uniform for physical reasons such as poor graft technique or as a result of buds growing towards the sun and producing the classic hockey stick effect. If the bud is faced to the south in the southern hemisphere it will grow up straight to the north results in the hockey stick form. This simple process will alleviate the need for heavy straightening staking activities.

Budded or grafted trees may produce side shoots from the bud or graft that without correct placement or care can produce undesirable results such as the 'hockey stick' style of growth seen on the right (Image 15). While on the left is a bud that has grown up and will fill in to produce a straight trunk (Image 16).

## Conclusion

There are numerous documents and books available to provide growers with the technical information to produce excellent quality trees and shrubs without relying on excessive staking to obtain straight upright trunks. Nutrition, competition, container and growing environment are critical factors to ensure successful healthy plant production.

With timely technically proficient pruning activities branch and trunk damage can be minimised and unsightly wound scars reduced in size and impact.

Train and keep training, it is critical to maintain a continual improvement model for technical knowledge when producing any plant stock.



## Additional Information

There are numerous different texts available on pruning and tree physiology but one which is highly recommended is;

Modern Arboriculture 1998 Alex L. Shigo (Sherwin Dodge Printers)

This book has numerous detailed drawings and descriptions for the large number of pruning options and well explained technical content relating to wound healing, disease management and tree physiology.

Shigo & Trees Associates has produced numerous educational books, brochures and DVDs including two soft cover books on pruning.