

HISTORY AND PRINCIPLES OF ROOT RESTRICTION

- **By Fred Field**

In Japan the history goes back 800 years, in China possibly 1000 years and the question arises why did they do it?

With the Japanese it mirrored nature's adversity in small trees which could overcome some extreme conditions which older trees couldn't. To Bonsai successfully one needs to start with very small trees (Large trees struggle with shock). My own research has shown and confirmed the many and varied ways of root restriction.

1. Binding the roots in a container.
2. Growing on a cliff face.
3. Minimising the available water.
4. Growing in a hostile environment.
5. Use of paclobutrazol hormone restriction called Cultar.

We all assume all trees have roots for the same reasons which couldn't be further from the truth, as most of them in the sea for instance, are used for anchoring and on the land it is again for anchoring and for uplift of water and trace elements, but most importantly above all these needs is the fact roots are the brain box of the plant as it determines the whole programme of how it develops, it has to overcome environmental change that humans couldn't survive 1 day in.

Over millions of years plants have hybridized and genetically changed to survive and flourish, humans don't, we scavenge on what plants produce, directly and indirectly. It is this long line of thinking and awareness to plants about what is actually happening such as the stages of suddenly knowing that insects are out there and devising a plan to use them but to reward them a plan of partnership as old as algae and lichen what has this got to do with roots? - Quite a lot - the roots haven't changed much but the genetically the plant or tree above the ground has.

The root system surveys the situation, thus in the ground as to what it can utilise such as weather, mineral and area and this is assuming we have brought the tree from a nursery. This will take some time for the tree to work out as it was probably grown in a nursery 200km away, where water comes on each day at 5 pm so a new plan must evolve, this is conclusively proved as to why it takes so long to start growing after planting. If we take a cutting or seed off a tree growing right beside our proposed extension the seed already knows a lot about the conditions that pervade there, so genetics play a vital role in the wellbeing of the plant. Genetically plants can change much quicker than other life such as insects, animals and they are also bigger opportunists than the recipients. So we have established that roots communicate with the top of the tree through the production of auxin at the tips of branches. One could assume that the leaves have some say in the day to day running of the plant only mechanically by shutting off the stomata to stop transpiration. The leaf is a factory designed for photosynthesis of which contribute to the development of the fruit and growth. The Roots will still generally work out the long term programme.

By restricting the roots will immediately to the following.

1. They will immediately assess the situation as to how much room is available and to give an example - pine trees in a forest all generally grow to the same height at the same time in the shady side of a hill as the sunny side - the roots from each tree survey an area to the next pine tree, so one would assume they are complimentary rather than competitive, and they don't produce many seed cones. (No attrition!) Compared to a lone pine in the middle of a paddock in say inland Canterbury, continual production of seed cones, this could be attributed to the roots assuming that it was alone

and must reproduce to protect the species or the constant threat of attrition with wind and draught sends the same message. A combination of factors is more likely.

2. The roots instruction will be to reduce the size of the leaf to restrict transpiration.

3. Woodstock production is reduced. Excessive fast Woodstock production invites more disease and insect infestation as the cell structure is weak, also fruit will abort as the carbohydrates are diverted to Woodstock productions.

Leaves are protein driven and need nitrogen and fruit is sugar driven and undergoes a different set of biological process and one assumes that if the carbohydrates etc are not used for wood production they will be stored in the cambium for conversion to sugars.

4. Growing in root restriction bags Above The Ground offers many advantages to the commercial growing, aeration of roots, mobility of one crop in Tunnel Houses to another.

5. Growing in Ground Bags is successful if the plant is started small so it can plan its future for survival. These are deep cylinder bags, where the plant can always find some moisture down deep. (These must be in free draining soils).

6. The success of the tree in BAGS is to physics, not biology and the relationship between diameter and pressure. Roots in the bags do not encircle the bag above the ground, they air prune, in the ground when moisture disappears they wall off and shut down, and when conditions improve, the process of producing fibrous roots starts again. A tree can literally survive on 1 litre per week in the ground bag. Over watering is the demise of 80% of fruit trees, over fertilisation say 15% and under watering 5%.

7. ROOT RESTRICTION BAGS also offer a new approach for landscape design, allowing virtually any species of plant to be used in conjunction with each other, with better utilization and contrast in garden design for small spaces. Plants used in orchards and landscape designs have the added advantage that they have capital value separate from the location in which they were planted. They can be traded at any stage of their growth or age and relocated. They could be just as mobile as their owners, their pet animals or furniture.

The research we have been doing over the last 20 years re tree growth control is many and varied and is based on observations and trials on many types of trees and shrubs, so the need to research the tree of its origins to modify the type of root restriction to achieve the optimum result is of considerable importance. We have now combined a form of cincturing of the tree to apply pressures at certain points to assist root control, once the tree has attained maximum growth, sometimes a combination of certain over invigorated trees succeeds.

SUMMARY

Advantage of bag control.

1. Minimum of pruning.

2. Capital investment - tangible asset.

3. Allows for manipulation of the season such as moving trees onto glasshouses for early production or holding in chillers for late production.

4. Higher yields per hectare.
5. Claim for depreciation of trees when appreciating.

Disadvantages.

1. Slightly higher set up costs.
2. More preparatory work - this is all offset with long term management of large trees.

GENERAL SUMMARY.

Root control is here to stay for basic reasons such as:

1. Grower controls the orchard not the orchard controlling the grower.
2. Higher sustainable returns per hectare, with the option of leasing land and putting capital into production.
3. Low cost of protective structures against birds, wind, and frost to shore up unnecessary risk.