

BRANCH INDUCTION FOR BETTER GROWTH

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As with many other crop species, the yield of *Hevea* has also been at least doubled with improved genetic materials. Nevertheless, a better understanding of the processes involved in the conversion to increase productivity of plants will surely be useful in obtaining the full potential of the species. The green cells of the higher plants assimilate more than their own requirements to nourish the non-photosynthetic tissues. The substrate materials from green photosynthesizing assimilating tissues are then transferred to growing regions or storage organs. The partition and distribution of assimilates is very important in plant growth and development. Moreover, in crop plants, altering the normal assimilate patterns and distribution, with plant hormones, would serve as a tool to increase productivity. Though photosynthesis is responsible for 90-95% of the dry weight of the plant, the mineral status such as nitrogen and potassium concentration may affect the rates of CO₂ assimilation. Many plant pathogens inhibit photosynthesis by damaging chloroplast, inhibiting chlorophyll synthesis or by destroying specific chloroplast proteins. Moreover, high rates of dark respiration, poor root growth, mutual shading of leaves and low total leaf area also affect the photosynthesis of the plant and thus the productivity. However, a relationship between the photosynthesis and increased total leaf area of a tree which will possibly be shown by the growth of the plant, may exist.

Once the germinated seed develops into a small seedling or, a grafted bud grows out with a few green leaves, the plant starts synthesizing its food on which the entire plant depends for survival and growth. The size and the shape of the leaves are generally clonal characteristics. Also the pattern of the branching and the shape of the canopy or the canopy architecture may be related to the clone as some variation is seen in branching habits among different clones. Nevertheless, considerable variation is observed among the trees of the same clone.

Generally, in rubber after 1½-2 years of monopodial growth, both seedlings and buddings start branching naturally. Nevertheless, it has been noticed that, certain trees grow very tall before they branch which some times results in small crowns. Girthing is evidently slower in such trees and therefore takes relatively more years to reach the recommended grith for tapping. Normally, variation in growth & yield is seen among individual trees of any clonal population. This may be due to both genetic and environmental variance. Though the grafted buds belong to one clone, once they are grafted onto unselected seedlings, variation, often called a result of the stock-scion interaction, is shown. Differences in branching habits may be due

to both inherent and environmental factors. Planting distance and density may also influence the canopy architecture.

However, the aim here is to discuss some beneficiary effects that can possibly be achieved by adopting the technique of branch induction. This may influence the growth of the tree and therefore can be used to reduce the variation in growth. As the growth of the tree correlates with the yield within a clone, reduction in the variation in yields may eventually results.

In a study carried out to find out the correlation between the number of branches and the tree growth, it was revealed that a high positive correlation existed between the two. Clearings of five clones, i.e., RRIC 100, RRIC 102, RRIC 110, RRIC 121 & RRIC 130 were used in this study and from each clone, clearings aged 1-7 years were used.

The general observation common for all clones suggested a positive correlation between the number of branches and the tree girth. However, this effect was not clear for the trees aged 1-2 years possibly because these trees hardly contained large branches. As far as the girth of the trees is concerned, an increase in the standard error values with the age was observed. This suggests an increasing variation in girth among trees as the trees age.

The canopies of individual trees were also grouped arbitrarily, according to their growth and distribution. Again the trees having large canopies showed better growth. Those with poor canopies had a low girth and those with intermediate canopies had a value in between.

This was observed in all clearing and was highly significant. Better girthing of trees having a higher number of branches or better canopies is not surprising, though many other factors possibly contribute and control the growth of a tree. Although data are not available to support that deliberate branch induction of trees would increase the growth, yet from the information available from other countries, it can be predicted for such correlation to exist.

The main concern here is whether branch induction can effectively be used to cut down the long immature phase. Often, it is the uneven growth of the trees in a clearing, which delays the opening up of the trees (Seneviratne *et al*, 1996). At least 60% of the trees should be in the tappable stage. Though it is evident that branching is a clonal characteristic, in all the clones studied, the number of branches varied from zero to about 10 (as far as the ½ size branches are concerned).

Apart from the timber value, the value of a rubber tree depends, first whether it is grown up to the tappable girth, and then, the yield. Tappable trees are selected by the girth, i.e. 50 cm measured at 120 cm from the graft union. On the other hand, the amount of latex or the yield per tree per tapping is a clonal characteristic. Nevertheless, it seems that this has a positive correlation with the girth of the tree, perhaps due to the higher number of latex vessels that can be accommodated in a

tree with a bigger trunk.

Evident from similar studies carried out elsewhere also supports this idea of better girthing of plants having more branches. Some suggests delaying the removal of lower branches until the tree develops upper branches, spontaneously or by inducing, is beneficial for the plants' growth. Anyhow branch induction and removal of unsatisfactory branches, should be carried out as recommended, and as early as possible.

Normal recommendation on removal of lower branches is to remove them as they appear, since removing large branches may result in large scars. The idea here is for the tree to have a smooth trunk up to about 8 feet. However, the wound caused by removal of a branch, even at two years of age, should be fully recovered at the commencement of tapping which will be at least after another three years.

In a clearing of any clone, it may be only a certain percentage of trees that require induction of branches. This percentage may vary depending on the clone, environmental factors, etc.

As far as branch induction is concerned, several techniques may be applicable for rubber. The basic requirement is to disturb temporarily, the flow of plant hormones produced at the apex. Once the lower part of the stem is deprived of this hormone supply, the dormant buds burst out and elongate. The number of buds that grow out may also vary. However, 3-4 well-spaced branches are ideal as too many branches growing at the same time might retard the growth of all of them.

Branch Induction

Two methods are recommended by the RRISL for branch induction. One is leaf folding method. This method can be used when the top whorl of leaves is hardened or pendent (Fig. 1a). The apex is covered with a few leaves of the top whorl (Fig. 1b). The other method is leaf cap method which can be practiced when the terminal bud is at bud break or the young leaflets have just unfolded (Fig. 2a). Here, 3-4 mature leaves removed from a lower branch (Fig. 2b) are used to cover the apex (Fig. 2c). In both cases, the apex is covered from light and as a result, the hormone synthesis in the apex has temporarily ceased. Nevertheless, the following points are very important in successful branch induction.

1. The apex of the main stem should never be removed or damaged. This will result in poor and imbalanced canopies.
2. For both leaf cap and leaf folding methods, a rubber band should be used to hold the leaves. Galvanized wire or any permanent materials should not be used.

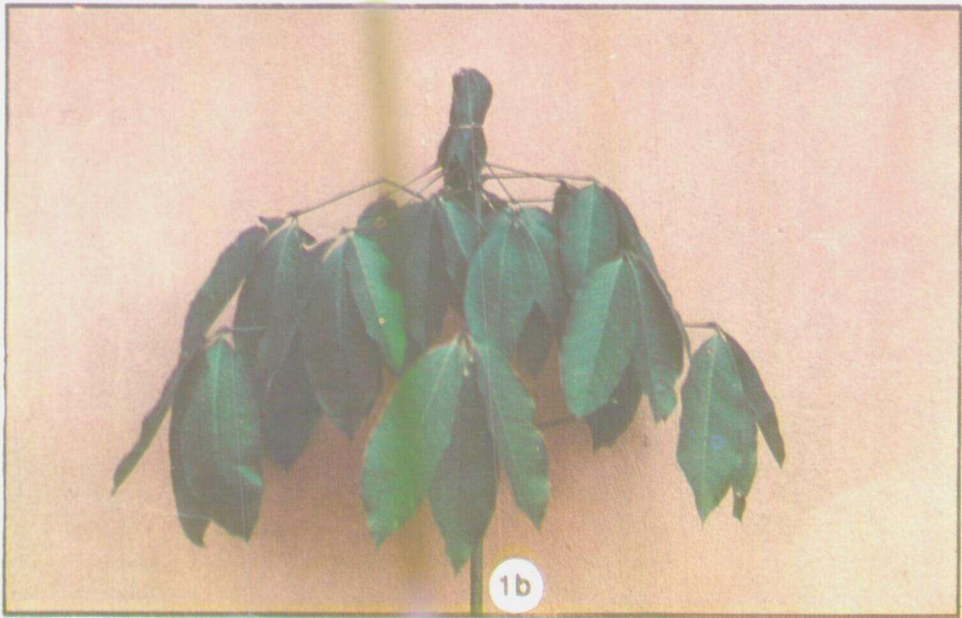


Fig.1. Leaf folding method, (a) Plants with pendent or hardened top whorls and (b) Apex covered with a few terminal leaves.

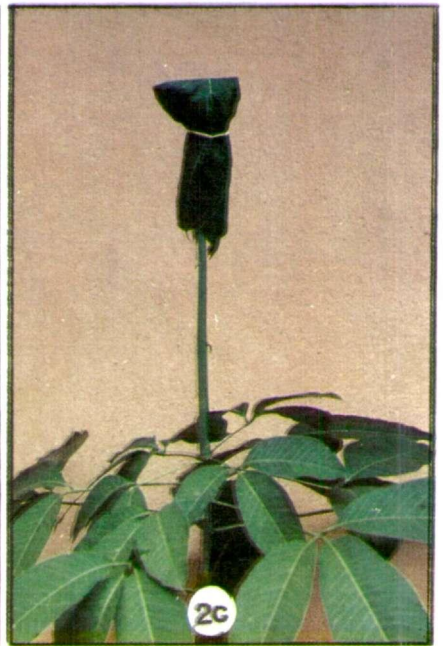


Fig.2. Leaf cap method (a) Plant with a terminal bud at the immature phase (b) Few mature leaves & a rubber band (c) Apex covered with leaves.

3. Covering the apex should be done for 2-3 weeks only. However, if rubber bands are used for this, they will not last more than 2-3 weeks under out door conditions.
4. Other techniques such as ring-barking the stem recommended in other countries in the past to induce branching have been found to give unnecessary stress to the tree.
5. Each induced tree should be checked once or twice at least, to make sure that desirable branching has taken place.

A well-balanced canopy is of vital importance for the tree as leaning, hending, branch-break, trunk snap and even falling of the tree can happen due to asymmetric canopies. Moreover, the growth, specially during the immature phase before the canopies get closed and overlapped, may be correlated to the number of branches in the trees.

Apart from the number of branches, an ideal branching system may consist of, the main stem persisting into the upper part of the tree giving rise at short vertical intervals to many relatively light branches evenly spaced around the trunk at wide angles to the trunk (Fig.3). V-fork branching (Fig.4) has the disadvantage of losing the main stem and also consist of the risk of losing one half of the canopy due to branch break. Poor branching at the lower part of the tree (Fig.5) often results in small canopies as larger branches do not form at the top part of the tree.



Fig.3. Satisfactory branching, six years old RRIC 100 tree.

Fig.4. V-fork branching, seven years old RRIC 121 tree.

Fig.5. High level branching, six years old RRIC 121 tree.

REFERENCES

Seneviratne, P, Nugawela, A and Ramawickrama, D (1970). The importance of selecting planting materials at nursery stage. *Bulletin of the Rubber Research Institute of Sri Lanka* 33, 34-44.