FIELD EXPERIENCE OF CONTROLLED PRUNING IN IMMATURE RUBBER

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SUMMARY

Controlled pruning as recommended by Yoon *et al* (1983) has become a popular method of increasing leaf area during the immature phase of rubber as it results in better growth and also formation of a more balanced canopy than the previous estate practice of flush pruning all branches until a height of 275 cm before allowing trees to branch permanently.

However, some practical field problems have also emerged from implementation of the technique viz. suppression of growth of leader shoot, over-pruning of canopies during the early stages of branching, underpruning of large branches during the later stages of immaturity and increased incidence of Pink disease as a result of reduced air circulation beneath the canopy.

Early pruning of strong lateral branches among the cluster of branches and subsequent gradual pruning of the remaining branches up to 250 cm height to achieve an 'ideally balanced tree structure' have been proposed to overcome the above draw-backs.

The formulation of an 'ideally balanced tree structure' has been based on measurements of height of branching and radius of drip-line of the various stories of the canopy.

On the basis of the above, two revised pruning schemes have been proposed for two broad groups of clones which have been observed to show differences in clonal response to controlled pruning.

INTRODUCTION

The rate of growth of a plant in the early stages is determined to a large extent by the amount of leaf area on the plant. Yoon (1973) observed that trees with a low height of branching and therefore more leaf area, girthed better than trees with late branching (Table 1).

Table 1: Effect of height of branching on girth of 23 month old RRIM600 (after Yoon, 1973)

Ht. of branching (cm)	No. of trees	Mean girth (cm)
300–360	370	13.2
360–420	364	12.4
>420	210	11.6

Following this observation, Yoon (1973) recommended inducement of branching using the double ring bark device to increase leaf area on late branching trees of 18 months or older.

The leaf folding and leaf capping methods were proposed a few years later to induce early branching on younger trees (1976).

Observing that branching occurs naturally at an early stage on most trees Yoon *et al* (1976) and Leong and Yoon (1983) laid down trials to determine if leaf area and its resultant benefits could be further enhanced by low and controlled pruning of branches. They found that girthing was enhanced, dry matter production increased, and both canopy density and branching habit improved with this technique as compared with normal estate pruning.

Consequently they proposed a procedure for controlled 'three whorl-branch pruning' (1983) comprising an early stage corrective pruning followed by three stages of controlled pruning.

Basically the early stage corrective pruning consists of removing all initial abnormal branching which occur, e.g. 'V' fork branching, multiple branching with dead terminal etc. which may suppress growth of the leader shoot. The next stages of controlled pruning consist of allowing branches to arise freely until three whorls of branches are

attained wherefrom the lowest whorl of branches are pruned off. This process is repeated until a height of about 2.0 m from the union is reached when pruning would cease.

This technique has become a more popular method of increasing leaf area during early growth than branch induction as it also produces a more balanced tree, eliminating the need to prop up trees as is sometimes necessary in branch induction.

The controlled pruning technique was adopted by a large Plantation Group after some minor modifications based on their own evaluation of the system.

Overall the Group's adoption of the technique has resulted in observed better growth and also in the formation of a more balanced canopy compared to the previous estate practice of flush pruning all branches until a height of 275 cm before allowing the tree to branch permanently.

However some practical field problems have also been observed from implementation of the technique viz;

(a) suppression of growth of terminal shoot even after corrective pruning, particularly in clones PB217, PB255 and occasionally in other clones. This has been observed to be due mainly to clustering of branches at the whorl where some strong branches tend to retard growth of the terminal shoot.

(b) significant reduction in canopy size and therefore leaf area at the stage of pruning of the lowest whorl branches after attainment of the three whorl branch stage. Between the 12th and 18th month period, canopy size also appears much reduced in relation to the trunk which has occasionally resulted in slight leaning of trees.

(c) presence of low large branches after the fourth year which would interfere with high level tapping particularly on clones where branches do not self prune easily e.g. RRIM 600, PB217, PR261, and also occasionally in the other clones.

(d) increased incidence of Pink disease as a result of (c) due to reduced air circulation beneath the canopies.

In view of the above, the structure of the tree was examined in greater detail with a view to overcoming the disadvantages encountered.

MEASUREMENTS

(a) **Height of branching**

The height of branching of the various whorls of branches from the ground was measured. Measurements were carried out on 100 trees of 18 month old PB260 in each of three estates and also on 100 trees of PB217 of similar age in another estate. Trees with at least 5 whorls of branches were randomly selected in each field for the measurement. Where the lower branches had been pruned off, the point of measurement was taken from the position of the scars left behind after pruning.

(b) **Radius of drip-line**

The radius of drip-line at the various whorls of branches was also measured on 100 trees in one of the PB260 plantings.

(c) **Angle of branching**

The angle subtended by branches was visually estimated from the same trees where the radius of drip-line was measured.

RESULTS

(a) **Height of branching**

The height of branching at the various whorls of branches is show in Table 2.

Table 2: Height of mid branch from the ground of various whorls

(cm)

Estate/Field ha.	Whorl of branches 1st	2nd	3rd	4th	5th
Estate A					
46 ha PB260	91	145	199	256	309
Estate B					
63 ha PB260	93	146	195	246	297
Estate C					
49 ha PB260	76	127	176	230	281
Mean	87	139	190	245	296
Internode length		52	51	55	51
Estate D					
44ha PB217	70	112	160	217	277

Following the initial corrective pruning of all branches below 60 cm as per Company pruning policy, the subsequent first whorl of branches emerged at about 87 cm from the ground for PB260. Thereafter branching occurred at around 140 cm, 190 cm and reached 245 cm at the 4th whorl. Corresponding height of branching for PB217 was marginally lower than for PB260.

Length of internodes was fairly regular at about 50 cm from the first to the fifth whorl for PB260 but appeared to increase with increase in height of branching for PB217.

(b) **Radius of drip-line**

This is shown in Table 3.

Table 3. Radius of drip-line of various whorls of branches (cm)

Estate C	Whorl of branches				
	1st	2nd	3rd	4th	5th
49 ha PB260	132	108	80	50	20
	(24)	(28)	(30)	(30)	

Figures in brackets denote difference in drip-line distance between succeeding whorls.

Mean radius of drip-line decreased with increase in height of branching. Radius of drip-line was 132 cm in the first whorl and 20 cm in the 5th whorl.

The distance between drip-line of succeeding whorls increased with increasing height of branching. Drip-line distance between the first and second whorl of branching was 24 cm but increased to 30 cm between the 4th and 5th whorl.

(c) **Angle of branching**

This was estimated to be about 70° from the trunk.

DISCUSSION

Theoretically controlled pruning should aim at obtaining optimum leaf area for maximum growth of trunk. In practice however, the requirements involved to achieve the above condition are difficult to spell out. Alternatively it may be useful to formulate an 'ideally balanced tree structure' which could provide adequate leaf area and also a balanced canopy for vigorous growth of trees during immaturity.

IDEALLY BALANCED TREE

Superimposing three levels of pruning on the tree structure plotted out from the measurements derived from the exercise, the typical tree shape obtained may be represented in diagram 1.

1. **Five whorled branching tree**

   No pruning of branches has been undertaken.

   a) ratio of canopy depth to crotch height is about 8:3.

   b) height of lowest whorl of branches is about 85 cm.

   c) radius of widest drip-line is about 130 cm.

   Trees with such a shape appear underpruned. Leaf area is however large.

2. **Four whorled branching tree**

   The lowest whorl of branches has been pruned.

   a) ratio of canopy depth to crotch height is about 6.5:4.5.

   b) height of lowest whorl of branches is about 140 cm.

   c) radius of widest drip-line is about 110 cm.

   Such a tree shows a well balanced canopy. Leaf area is however smaller than the five whorled branching tree.

3. **Three whorled branching tree**

   a) The lowest two whorls of branches have been pruned.

   b) height of lowest whorl of branches is about 190 cm.

   c) radius of drip-line is about 80 cm.

   Trees appear overpruned, resulting in a slender trunk with smallish canopy.

On the basis of the foregoing, an ideally balanced tree structure with adequate leaf area should therefore have a structure set between the four whorled and five whorled branching tree.

Whilst controlled pruning should aim at achieving the aforementioned 'ideally balanced tree shape', the other drawbacks encountered may be rectified as follows:–

1. suppression of growth of terminal shoot – This may be overcome by pruning off all strong branches among the cluster of branches in the early stages of branching. It has been observed that leaving up to four small branches unpruned at each whorl of branching would provide adequate canopy balance to the tree and also eliminate the problem of terminal shoot suppression.

2. Points (b), (c) and (d) in the aforementioned introduction may be resolved by gradual pruning of branches left behind from (1), removing one branch at each pruning round, starting from the lowest whorl and moving upwards until a height of 250 cm is reached when pruning should cease. To obtain the ideally balanced tree shape, pruning of the first branch on the lowest whorl should commence after trees have reached the fourth whorl stage of branching. Carrying out this procedure would increase the length of tappable trunk, improve circulation of air beneath the canopy and also avoid a sharp drop in leaf area when all branches in each whorl are simultaneously pruned off as encountered previously. Table 2 shows that up to and including the third whorl of branches would have to be pruned to obtain a branch free trunk of about 250 cm.

REVISED CONTROLLED PRUNING SYSTEMS

Two revised systems based on clonal response to pruning have been proposed as follows:–

Controlled pruning System A

This system is applicable to all clones except PB217 and PB255 and all other clones showing significant suppression of terminal shoot by strong side branches (see Appendix 1):–

- *Prune off all branches as soon as they arise from below 60 cm in the initial months after field planting.*

1. Thereafter allow the next whorl of branches to emerge freely. On hardening, prune off all strong branches on this first whorl of branches leaving behind a maximum of up to four well spaced small branches.

2. Repeat process (1) for the next whorl of branches, again leaving behind a maximum of up to four well spaced small branches on this whorl.

3. Repeat process (2) for the third whorl of branches, leaving behind a maximum of up to four well spaced small branches on this whorl.

4. a) Allow all branches of the fourth whorl to grow without removal of any strong branches.

   b) Remove the strongest branch on the first whorl after hardening of the fourth whorl.

5. Subsequently and at monthly intervals, remove the strongest branch from the lowest whorl. Working upwards, remove one branch (the strongest) each month until a height of 250 cm is reached.

6. Do not prune beyond a height of 250 cm, allowing the tree to branch naturally above this height.

Controlled Pruning System B

This is applicable to clones PB217, PB255 and all other clones showing significant suppression of terminal shoot by strong side branches.

- *Remove all branches as soon as they arise from below 125 cm in the initial months after planting.*

1. Thereafter allow the next whorl of branches to emerge freely. On hardening, prune off all strong branches on this first whorl leaving behind a maximum of up to three well spaced small branches.

2. Repeat process (1) for the next whorl of branches, again leaving behind a maximum

of up to three well spaced small branches on this second whorl.

3. Repeat process (2) for the third whorl of branches, leaving behind a maximum of up to three well spaced small branches on this whorl.

4. a) Allow all branches of the fourth whorl to grow without removal of any strong branches.

   b) Remove the strongest branch on the first whorl after hardening of the fourth whorl.

5. Subsequently and at monthly intervals, remove the strongest branch from the lowest whorl. Working upwards, remove one branch (the strongest) each month until a height of 250 cm is reached.

6. Do not prune beyond a height of 250 cm, allowing the tree to branch naturally above this height.

Despite the delay in removal of unpruned branches until hardening of the fourth whorl, risk of scars appearing on the trunk appears minimal as Yoon *et al* (1976) have shown that branches up to a size of 6–7 cm in diameter which are pruned, heals over within 10 months. Also, as only the smaller branches would be left behind in the early pruning rounds, their size when finally pruned would not be unduly large as to leave behind significant scars.

All strong branches should be flush pruned to prevent the emergence of side shoots when thinning them out from among the cluster of branches.

At any other stage of growth, all strong branches from among the remaining branches which appear to suppress the leader should also be pruned off. To maintain stability of the tree, do not flush prune these later strong branches but prune just below the lowest whorl of dormant buds.

It is essential that a gang of workers be specifically trained for this skilled job and that the same workers are used in subsequent rounds of pruning under strict supervision.

GENERAL

When carried out properly, controlled pruning should result in vigorous growth of trees and the formation of a balanced canopy.

ACKNOWLEDGEMENT

The Managers of the various estates are thanked for their assistance in this exercise.

Thanks are also due to Mr. Chew Poh Soon, Head of Agricultural Research and Mr. Ong Tee San, Senior Research Officer, both of Applied Agricultural Research Sdn. Bhd. for their valuable comments in the preparation of the paper.

Finally Mssrs. Boustead Estates Agency and Taiko Plantations are thanked for permission to publish the paper.

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