VIRGIN BARK TAPPING OF RRIC 100, RRIC 101 AND RRIC 103

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ABSTRACT

All three clones, RRIC 100, 101 and 103 responded with substantial yield increases when the tapping intensity was increased, after the third year of tapping, from ½ S d/3 to ½ S d/2; RRIC 103 gave the highest and sustained yields with ½ S 2d/3 tapping. The girth increment and incidence of brown bast were not adversely affected by the increased tapping intensities. There was no advantage with any of the clones in tapping two panels of a tree on a rotational basis, whether the rotations were d/2, d/3 or yearly, as against tapping any one panel continuously to completion.

Separation of the two cuts by 106 cm compared to the conventional 53 cm was also not beneficial. RRIC 101 and 103 responded well to puncture tapping except that the incidence of brown bast was high on RRIC 103, possibly due to the extra-long (2 m) tapping band on it. The girth increment of RRIC 101 was lowest with puncture tapping. RRIC 103 also yielded well on ½ S d/2 tapping with ethrel stimulation.

INTRODUCTION

Hevea brasiliensis clones RRIC 100, 101 and 103 are of excellent growth vigour and high yield surpassing PB 86, the most widely planted clone in Sri Lanka until recently in both these characters (Fernando, 1977). However, RRIC 100 and 101 have low plugging indices and long flow durations (Waidyanatha and Pathiratne, 1971) ; and RRIC 101 in particular is observed to be very prone to late-dripping and brown bast. Therefore, a cautious and tentative recommendation of half spiral third daily (½ S d/3) tapping for the first three years, and half spiral second daily (½ S d/2) thereafter, has been made for commercial plantations of clones RRIC 100 and RRIC 103 ; and half spiral third daily tapping to be continued for clone RRIC 101.

Performance, therefore, of these clones under different tapping intensities and systems need be known for optimising their exploitation and for making firmer recommendations to the growers.

We report here the response of the three clones to several tapping systems and intensities after they were initially tapped on the ½ S d/3 system for three years.

MATERIALS AND METHODS

The three clones had been established from budded stumps in three separate but contiguous blocks at Eladuwa Estate, Paiyagala in the Kalutara District, in November/December 1969. The terrain is flat to gently undulating and the soil is red-yellow podsolic (Boralu series ; Silva, 1971). This location receives a fairly well distributed rainfall of about 3100 mm, January and February being usually dry.

The rubber trees were spaced 2·4 × 9 m and each plot had three (RRIC 101) four (RRIC 100) and five (RRIC 103) trees in a row ; there being six replicates for each treatment on a randomised block design. The trees were fertilized according to the standard recommendation (Anon, 1972). They had been tapped by the estates on the ½ S d/3 system commencing November 1975, until the experimental treatments were imposed in July 1978, at which time the lower end of the cut was on average about 55 cm above the graft union.

The tapping treatments were not the same for all clones. They have been denoted according to the revised notations (Lukman 1981) and some of the notations used here are explained below.

½ S	=	Half spiral tapping cut
d/2, d/3	=	Tapping frequency — second daily and third daily
2 × y	=	Two panels tapped alternatively, one each year
2 × t	=	Two panels tapped alternatively, one at each tapping
↑	=	Tapped upwards (absence of arrow indicates all cuts tapped downward only)
↑ ↓	=	Upper panel tapped upwards and lower panel downwards
53 cm, 106 cm	=	Distance between tapping cuts on a tree
Examples :		½ S, ½ S d/2 (t t,) 53 cm = Two half spirals tapped alternatively with only one panel tapped one day and the other two days later.

6 Pg/100 (0·5) d/2 ET 2·5% 12/y (m)

The above puncture tapping (Pg) notation denotes 6 punctures on a 100 cm long, 0·5 cm wide vertical band made alternate daily with 2·5% Ethrel applied 12 times a year at monthly intervals.

Ethrel (Ethepon ; Amchem Products Inc., USA) was diluted as required using coconut oil. A steel needle *ca* 1·0 mm diameter was used for puncturing the bark. A puncture tapping procedure as described previously (Waidyanatha and Angammana, 1981) was adopted. Conventional (excision) tapping was done with the standard Michie-Golledge tapping knife.

Latex from each plot was collected, coagulated and milled. The rubber was smoke-dried to constant weight.

Girth of trees was measured at 200 cm above the graft union, avoiding the tapping cuts.

RESULTS

In the computation of yield data, as normally done, it has been assumed that there were only 280 tappable days per year, that is, 93, 140 and 186 days for d/3, d/2 and 2d/3 frequencies of tapping respectively and that one hectare contained 394 tappable trees.

Yields, girth increments and brown bast statistics of each of the clones for the various treatments have been examined on an yearly basis, but as the response trends have been consistent, only the data summarised for the total 3·5 year period are presented here.

RRIC 100

Both half spiral alternate daily tapping systems (½ S d/2) have significantly out yielded the half spiral third daily (½ S d/3) system (Table 1). Tapping two panels (½ S, ½ S) alternatively on a d/2 basis gave less yield than tapping the same panel (½ S d/2) continuously.

Table 1. *Mean yield, girth increment and % brown bast cuts of treatments of RRIC 100 for 3·5 years (July 1978 to December 1981)*

Treatments	Mean yield (kg/ha/yr) lower cut	upper cut	Total	%	Mean girth increment (cm/t/yr)	% Brown bast cuts
½ S d/3	1747	—	1747	100	3·0	Nil
½ S d/2	2406	—	2406	138	2·5	4·2
½ S, ½ S d/2 (53 cm)*	1198	854	2052	117	3·2	4·2
½ S, ½ S d/2 (106 cm)*	1248	820	2068	118	3·5	4·2
LSD (0·05)			237	14	N.S.	
,, (0·01)			333	19		

*Distance between the two cuts on a tree.

The girth increments were not significantly affected by the tapping treatments, but the % brown bast was higher for all d/2 tappings although it is within tolerable limits.

RRIC 101

Except for two, the other ½ S d/2 treatments have yielded, on average, about 50% more than the ½ S d/3 system (Table 2). This is to be expected if the yield per tree per tapping were comparable for the d/2 and d/3 tappings.

Table 2. *Mean yield, mean girth increment and brown bast cuts of treatments of RRIC 101 for 3·5 years (July to December 1983)*

Treatments	Mean yield lower cut	(kg/ha/yr) upper cut	Total	%	Mean girth increment (cm/tree/yr)	% Brown bast cuts
1. ½ S d/3	1269	—	1269	100	1·6	11·1
2. ½ S d/2	2295	—	2295	181	1·5	11·1
3. 2 x ½ S d/2 (↓ ↑) (2 x y) (53 cm)*	—	—	1912	151	2·5	8·3
4. 2 x ½ S d/2 (↓ ↑) (2 x y) (106 cm)*	—	—	2047	161	1·7	16·6
5. ½ S ½ S d/2 (↓ ↑) (2 x t) (53 cm)*	1007	911	1918	151	2·5	8·3
6. ½ S ½ S d/2 (2 x t) (53 cm)*	1069	895	1953	154	1·6	13·8
7. ½ S ½ S d/2 (↓ ↑) (2 x t) (106 cm)*	1032	920	1952	154	1·4	8·3
8. ½ S ½ S d/2 (2 x t) (106 cm)*	992	884	1876	148	1·9	8·3
9. 6 Pg/100 (0·5) d/2	—	—	2041	161	1·2	Nil
ET 2·5% Ba 1 (0·5) 12y (m)	—					
LSD (0·05)			274	22	0·8	
,, (0·01)			366	29		

*Distance between the two cuts on a tree

The 81% more yield for the conventional ½ S d/2 system than for the ½ S d/3 system appears unrealistic and is hard to explain. There has been no advantage in yield, girth increment or incidence of brown bast from tapping two ½ S cuts alternatively either on d/2 or on an annual basis as against tapping the same ½ S cut continuously. Similarly, wider separation (106 cm) of the two ½ S cuts than conventional (53 cm) when on the same tree, or the direction of tapping (upwards or downwards) of the cuts had no significant effect on yield.

Puncture tapping of a 1 m band with 6 punctures on a d/2 basis has yielded approximately as much as the average for the ½ S cuts. It is of interest that the puncture tapped trees were not affected by brown bast, whereas its incidence had been rather high for all the conventional tapping systems.

The girth increments did not reveal any clear trends except that the puncture tapped trees had the smallest girth increments. This needs follow up.

RRIC 103

Increasing the tapping frequency and hence the tapping intensity of the ½ S cut from d/3 through d/2 to 2d/3 correspondingly increased yields significantly. Again, there was no advantage in tapping two ½ S cuts alternatively as against tapping the same ½ S cut continuously, or in wider separation of the two cuts than is conventional as was also observed with the other two clones.

Puncture tapping of a 2 m band as well as ½ S tapping with Ethrel stimulation yielded more than ½ S tapping, although the differences failed to reach significance at the 5% level.

Table 3. *Mean yield, girth increment and % brown bast for treatments of RRIC 103 for 3·5 years (July 1978 to December 1981)*

Treatments	Mean yield (kg/ha/yr) lower cut	upper cut	Total	%	Mean girth increment (cm/tree/yr)	% Brown bast cuts
1. ½ S d/3	994	—	994	100	3·5	6·6
2. ½ S d/2	1421	—	1421	143	3·0	Nil
3. ½ S 2d/3	1857	—	1857	189	3·0	Nil
4. ½ S, ½ S 2d/3 (53 cm)*	925	713	1638	165	4·4	3·3
5. ½ S ½ S 2d/3 (106 cm)*	1036	°133	1769	178	3·2	11·6
6. 12 Pg/200 cm (0·5)cm d/2	—	—	1706	172	3·0	16·7
7. ½ S d/2 ET 5%	1589	—	1589	160	2·8	Nil
Ba 0·5 (1·5) 12 y						
LSD (0·05)			343	35	0·7	
			462	49	0·9	

*Distance between the two cuts on a tree

However, in contrast to RRIC 101, puncture tapping recorded the highest incidence of brown bast in this clone. Notably, there was no brown bast at the ¼ S tapping with stimulation.

The sustained highest yields for the S/2 2d/3 tappings, the low incidence of brown bast and also the good rates of girthing, comparable with that for the S/2 d/2 tappings, is of considerable significance in that they suggest that this clone may be amenable to tapping on intensities higher than ½ S d/2, even on the virgin bark.

Lower versus upper cuts

In the respective treatments of all three clones except in one (treatment 5) of RRIC 103, the lower cut had given significantly (paired t-test analysis) more yield than the higher cut. In the case of RRIC 101, where the two cuts were tapped continuously on alternate days (treatments 5 to 8), the level of significance for the yield difference between the lower and upper cut increased from 5% to 1% as the height difference increased from 53 to 106 cm.

DISCUSSION

Sustained response of the virgin bark of a clone to a tapping system for a period over three years without adverse effects should be adequate testimony of its suitability for tapping of the virgin bark under a given set of environmental and agronomic conditions.

Both RRIC 100 and RRIC 101 yielded significantly more on the d/2 than d/3 frequency when tapped continuously on a single half spiral (½ S). RRIC 103 even yielded significantly more on a ½ S cut tapped 2d/3 than when tapped d/2. The higher yields at the higher frequencies of tapping is a reflection of the yields per tree per tapping remaining nearly comparable at the frequencies investigated. This suggests that the trees were able to withstand the level of exploitation imposed on a sustained basis and were able to turnover latex (rubber) at rates at which it was removed irrespective of the frequency of tapping. Therefore it would seem reasonable to conclude that after the third year of tapping, (the experiments commenced after three years of tapping of virgin bark on ½ S d/3) RRIC 100 and RRIC 103 can be economically exploited on the virgin bark on the ½ S d/2 system. Although RRIC 103 appears economically exploitable even on ½ S 2d/3, this would need ratification through wider experimentation. Despite the good yields, the high incidence of dryness of RRIC 101 at ½ S d/2 vitiates recommendation of this system for this clone even after the first three years of tapping. It would now be necessary to ascertain whether in fact RRIC 100 and 103 could be tapped at an intensity higher than ½ d/3 prior to the fourth year of tapping.

The rationale of wider separation of the two tapping cuts when they are on the same tree is the reduction, of overlap of the 'latex displacement areas' (Pakianathan *et al* 1975) and consequently the stress on the latex vessels. However, even if such a benefit does occur, it appears to be counteracted by the decreasing yield with increasing height of the upper cut. This latter effect may be explained by the concomitant decrease in root pressure with increasing height. Root pressure affects the turgor pressure of latex vessels and hence the flow of latex on tapping.

Therefore, considering that there is no advantage in yield of tapping two cuts on the tree alternatively on rotations, whether they be of few days or annual and the practical inconvenience of tapping higher panels, it appears rational to first exploit the virgin and renewed barks below the conventional tapping height of 105 cm before proceeding to exploit the virgin bark above, as is now conventionally practised.

Puncture tapping of both RRIC 101 and RRIC 103 has given high yields comparable with that of the best conventional tapping treatments. The high incidence of brown bast in RRIC 103 is however of concern, and the unduly long tapping band of 2 m may explain this. However, this system needs further testing. The response of ½ S cut with stimulation in RRIC 103 is also of considerable interest, particularly on account of the saving on bark in this system, and the absence of brown bast.

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