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VIRGIN BARK TAPPING OF SOME RRIC 100 SERIES CLONES

By

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SUMMARY

All RRIC 100 series clones reached tappability much earlier than the two control clones viz. RRIM 600 and PB 86. Significantly higher yield per tree per tapping was obtained in the first year on a ½S d/3 system compared to ½S d/2 tappings in many of the clones tested. However, during the second year there was no significant differences in yields obtained on both frequencies indicating that the tree was able to replenish the latex removed in a tapping, much faster than in the first year of tapping. The data presented indicate the possibility of tapping all recommended clones on ½S d/2 system of tapping from the second year, without any adverse effects.

INTRODUCTION

The RRIC 100 series clones bred in the 1950's were introduced in to plantations in the early 1970's. These clones are of excellent growth vigour and are capable of giving very high yields (Fernando, 1977). Some of them have low plugging indices and show a greater tendency towards bark dryness while others have medium plugging indices (Samaranayake and de Soyza, 1984). A tentative recommendation was made for the commercial plantations to exploit these clones on half spiral third daily tapping (½S d/3) for the first three years. The performance of these clones under different tapping systems and intensities were studied for optimizing their exploitation and in order to make a firm recommendation to the growers. A large scale experiment was established for this purpose in 1977 where 15 clones were planted with provision for introducing five tapping systems. This experiment has been in tapping for three years and the results obtained are discussed in this paper.

MATERIALS AND METHODS

The clones RRIC 100, 101, 102, 103, 104, 105, 108, 109, 110, 112, 113, 117, HP 2427 unregistered) RRIM 600 and PB 86 were included in this experiment. These clones were established in the field from budded stumps, on a randomized block design. The plants were spaced at 4·26m × 4·87m and each plot consisted of at least 40 plants. The plants were fertilized according to the standard recommendation (Anon., 1972). The infillings were done using polybagged plants.

Tree girths were recorded annually, the measurements were taken at a height of 90 cm and 120 cm from the highest point of the graft union before and after introduction of tapping treatments, respectively.

The five tapping treatments *viz*.

1. Half spiral, third daily, ½S d/3.
2. Half spiral, alternate daily, ½S d/2.
3. Half spiral, alternate daily for 3 years and two half spirals every third day from the fourth year, ½S d/3, 2 × ½S d/3.
4. Half spiral, alternate daily from May to December ½S d/2. Puncture tapping on 1 m vertical band alternate daily from January — April — 6PT/100 (0·5) d/2.
5. Puncture tapped on a 1 metre vertical band.

6PT/100 (0·5) d/2 were imposed in March 1983.

The tapping treatments were applied on a split plot basis. Tapping had to be delayed until slow growing clones PB 86 and RRIM 600 had a fair number of tappable trees. A tree was considered to have reached tappability, when the girth of the tree measured at a height of 90 cm from the highest point of the graft union was 50 cm or more.

Ethrel (Ethephon, Amchem, Products Inc., USA) was diluted as required using warm water. A steel needle of 0·1 mm diameter was used for puncturing the bark. Puncture tapping was done using the method described by Waidyanatha and Angammana (1981). Conventional excision tapping was done with the standard Mitchie Golledge tapping knife.

Latex from each plot was collected, the total volume measured, a 100 ml sample was coagulated, milled, dried and weighed. Total dry weight of latex from each plant and the yield per tree per tapping were then computed.

RESULTS

Growth vigour

Growth of all RRIC 100 series clones tested in this experiment was more vigorous than RRIM 600 and PB 86 which was reflected in the percentage tappability at 5·5 years from planting (Table 1).

Table 1. *Percentage tappability at 5·5 years from planting*

Clone	Tappability (%)
RRIC 100	65·7
RRIC 101	77·3
RRIC 101	85·0
RRIC 103	76·3
RRIC 104	84·5
RRIC 105	55·5
RRIC 108	49·0
RRIC 109	53·0
RRIC 110	88·8
HP 2427	78·0
RRIC 117	59·0
RRIC 113	73·3
RRIC 112	75·5
RRIM 600	43·5
PB 86	43·0

Response of clones to different tapping systems

Tapping treatments 2 and 3 were the same during the first three years. 2 × ½S d/3 tapping was introduced only from the fourth year.

The summary of yield data recorded in the first year of tapping is given in Table 2.

Table 2. *Mean yield (g/t/t/) during the first year of tapping*

	Tapping systems					
Clones	½Sd/3	½Sd/3	½Sd/2	½Sd/d 2 & PT	PT	Mean
RRIC 100	32·30	25·85	27·95	31·55	21·00	27·73
RRIC 101	45·25	43·20	41·85	48·63	31·35	42·04
RRIC 102	32·4	27·70	29·38	29·20	26·28	28·99
RRIC 103	29·78	19·73	20·35	22·80	19·78	22·48
RRIC 104	37·23	28·58	26·48	21·60	18·43	26·46
RRIC 105	18·60	16·60	14·18	16·10	19·90	17·07
RRIC 108	27·55	34·60	31·35	26·28	28·10	29·57
RRIC 109	34·65	33·73	39·95	42·98	25·45	35·35
RRIC 110	45·75	36·38	38·85	49·78	23·80	37·12
RRIC 112	29·13	30·63	29·73	30·95	30·43	30·17
RRIC 113	22·20	20·55	24·30	19·63	14·83	20·30
RRIC 117	34·50	24·50	24·70	25·30	20·73	25·94
RRIM 600	41·95	33·95	31·88	29·98	24·23	32·39
PB 86	32·85	23·88	26·18	31·75	17·93	26·51
Mean	32·38	27·93	28·20	28·89	22·58	

L.S.D. (0·05) 7·83 to compare tapping systems within a clone

A significant interaction between clones and tapping systems on yield was seen in the first year. In most clones the PT yields were significantly lower than those obtained on conventional cut tapping. There were no significant differences in yields with different tapping systems in clones RRIC 102, 105, 108, 112 and HP 2427, which significantly higher yields were obtained with ½S cuts on a d/3 frequency in clones RRIC 100, 103, 104, 110, 117, RRIM 600 and PB 86, when compared with yields obtained on a d/2 frequency. There was no significant difference in yields obtained from either frequency in clones RRIC 101 and 109.

During the second year of tapping too there was a significant interaction between clones and tapping systems on yield. PT continued to yield a significantly lower crop per tree per tapping in clones RRIC 100, 102, 103, 109, 110, 113, 117, RRIM 600 and PB 86 compared to cut tappings. However, there was no significant difference in yields obtained with ½S cut tappings either on d/2 or d/3 frequency in clones RRIC 100, 102, 103, 109, 110 and RRIC 113, where as d/3 yields were significantly higher in clones RRIC 112, RRIM 600 and PB 86 (Table 3).

Table 3. *Mean yield (g/t/t), second year of tapping*

	Tapping systems					
Clones	½S d/3	¼S d/2	½S d/2	½S d/2 + PT	PT	Mean
RRIC 100	33·67	30·47	29·37	30·17	21·50	29·03
RRIC 101	38·37	33·40	28·65	33·87	33·45	33·48
RRIC 102	33·95	30·77	28·97	27·47	21·75	28·58
RRIC 103	29·62	26·15	28·35	24·60	20·77	25·89
RRIC 104	24·32	30·07	27·42	24·75	21·35	25·58
RRIC 105	20·82	19·75	19·35	19·60	19·80	19·86
RRIC 108	34·27	33·22	31·27	32·67	28·80	32·04
RRIC 109	32·82	28·00	31·87	28·42	25·57	29·33
RRIC 110	45·12	43·92	44·02	41·30	28·27	40·52
RRIC 112	20·55	28·10	26·75	26·97	26·27	25·72
RRIC 113	23·42	22·77	22·30	22·90	14·60	25·59
RRIC 117	27·45	29·17	29·27	31·75	26·10	28·34
HP 2427	25·07	18·07	18·20	20·77	21·15	20·61
RRIM 600	29·07	31·15	34·47	25·67	19·20	27·91
PB 86	33·37	26·35	28·65	31·40	17·62	27·47
Mean	30·16	28·75	28·59	28·17	22·62	

LSD 0·005 = 6·642 to compare tapping system within a clone.

During the third year of tapping there was no significant interaction between clones and tapping systems on yield (Table 4). Mean yields obtained per tree per tapping on a d/3 frequency was significantly higher than the other three systems compared.

Table 4. *Mean yield g/t/t during the third year of tapping*

Clone	Tapping systems s_2d_3	s_2d_2	s_2d_2 change	s_2d_2 PT	PT	Mean
RRIC 100	36·1	33·4	34·8	29·4	30·1	32·76
RRIC 101	28·6	23·1	22·5	25·3	27·0	25·75
RRIC 102	38·9	33·3	32·4	30·5	31·7	33·35
RRIC 103	33·8	29·2	31·1	27·1	27·4	29·71
RRIC 104	25·8	27·4	28·8	25·7	20·5	25·64
RRIC 105	26·1	24·3	25·3	26·3	27·6	25·91
RRIC 108	35·4	30·2	26·9	31·7	28·5	30·53
RRIC 109	40·9	26·0	32·8	28·6	26·3	30·93
RRIC 110	54·3	42·3	40·9	35·9	36·4	41·95
HP 2427	29·1	22·2	18·4	25·5	25·6	24·14
RRIC 117	39·0	32·4	34·8	31·1	28·0	33·06
RRIC 113	29·5	23·1	24·8	21·0	18·8	23·41
RRIC 112	24·2	23·1	23·8	25·9	26·3	24·65
RRIM 600	33·5	32·5	31·9	29·0	23·6	30·06
PB 86	27·1	21·2	25·3	26·2	21·7	24·39
Mean	33·47	28·27	28·96	27·92	26·62	

L.S.D. P= 0·05 = 2·003 for comparison of tapping system means.

The summary of the analysis of variance of the average yield (g/t/t) is given in table 5.

Table 5. *Summary of the analysis of variance (g/t/t)*

Source of variation	df	Anova (g/t/t) Mean squares 1983	1984	1985
Blocks	3	308·8943	54·7815	75·6540
Clones	14	977·6404***	536·3473***	506·710*1
Error 1	42	42·7976	25·3369	51·820**
Tapping systems	4	738·8420***	507·6962***	409·9500***
Clones X Tapping systems	56	59·2955***	36·5384**	34·5660 N.S.
Error 11	180	31·9929	22·6651	30·9190

Girth increment on tapping

There were significant clonal differences in the increment in girth after one year of tapping (Table 6) and significant differences due to tapping systems too.

Table 6. *Mean annual girth increment*

Clones	Girth increment cm 1982 — 83	1983 — 84	1984 — 85
RRIC 100	4·545	2·22	2·980
RRIC 101	3·020	0·86	2·165
RRIC 102	3·220	1·94	2·810
RRIC 103	4·260	3·26	3·720
RRIC 104	4·306	3·05	3·975
RRIC 105	3·465	2·62	2·980
RRIC 108	3·755	1·89	3·145
RRIC 109	4·050	2·35	3·930
RRIC 110	4·535	2·00	3·060
HP 2427	4·025	3·26	3·820
RRIC 117	4·406	2·42	4·270
RRIC 112	4·906	3·00	4·840
RRIC 113	3·795	1·36	3·080
RRIM 600	4·105	2·95	3·900
PB 86	4·575	3·07	3·690
L.S.D.	0·543	1·42	0·585

The ½S d/2 tapping resulted in a significantly lower girth increment than ½S d/3 or PT (Table 7).

Table 7. *System of tapping and girth increment cm*

Tapping system	Year of tapping 1982 — 83	1983 — 84	1984 — 85
½S d/3	4·17	2·34	3·40
½S d/2	3·76	2·30	3·76
½S d/2	4·01	2·50	3·76
PT & ½S d/2	3·95	2·39	3·27
PT	4·41	2·45	3·25
	0·201	—	0·345

After two years of tapping, girth increments were significantly different in different clones, irrespective of the tapping systems. RRIC 101 recorded the lowest increment. In general, girth increments of all the clones were lower in 1984 compared to increments in 1983 and 1985.

At the end of the third year, again there was a significant difference in girth increment due to tapping systems. PT alone or in combination with CT resulted in a lower girth increment compared to ½S d/2.

Incidence of panel dryness

Incidence of panel dryness has been almost negligible in most clones, except for RRIC 101 and HP 2427, which recorded high incidence of dry trees on all tapping systems.

DISCUSSION

RRIC 100 series clones have been recommended to be exploited on ½S d/3 tapping system during the first three years of tapping. This was an interim recommendation made on the data available at the time (Waidyanatha *et al.*, 1983), until a firm recommendation was made. The total crop harvested can be very low on a d/3 frequency without yield stimulants, and it may not be economically viable to tap a plantation on d/3 frequency for as long as 3 years. Therefore it was necessary to ascertain whether these clones could be tapped at an intensity higher than ½S d/3 during the early years of tapping.

Fifteen clones grown in one location with provision for introducing five tapping treatments, have given a good opportunity to study the response of these clones, to different tapping systems when grown under similar agroclimatic conditions.

The clonal differences in yields observed in this experiment was similar to the trends seen in the clone evaluation trials (Jayasekera, 1985).

Yields obtained on puncture tapping was lower than those from cut tappings except in the third year, when yields comparable to ½S d/2 tappings were obtained. Puncture tapping yields are influenced very much by the weather conditions, because of its dependence on yield stimulants. The rain interference during the first two weeks after application of yield stimulant can drastically affect the crop in PT (de Soyza and Samaranayake, 1983).

Even though yields comparable to ½S d/2 tappings can be obtained on PT, the cost of yield stimulant has to be taken into account when comparing the economics of PT systems with cut tapping systems. When conventional tapping systems are considered, most clones recommended for planting have responded well to ½S d/3 system in the first year, giving higher g/t/t yields compared to ½S d/2 tappings. This indicates that the tree is unable to replenish the extracted latex when tapped at a higher frequency. During the second year, most clones gave comparable yields on both frequencies of tapping except for clones RRIC 117, RRIM 600 and PB 86 where d/2 frequency gave significantly higher yield per tree per tapping. The fact that the yields obtained per tree per tapping being comparable on both frequencies during the second year, indicates the ability of the trees to replenish the extracted latex much faster than in the first year. The incidence of panel dryness was negligible in all tapping treatments. Therefore, many of these clones, can stand d/2 frequency of tapping from the second year.

On a d/3 frequency the total crop obtained is very low compared to that on d/2 and economically viable yields cannot be obtained on a d/3 frequency without the use of yield stimulants. This experiment indicates the possibility of exploitation of these clones on ½S d/2 system of tapping from the second year.

The girth increments of RRIC 100, 101, 102 and 105 was significantly reduced than those of the other clones after three years of exploitation. This indicates that the growth of the tree in these clones is affected by the extraction of latex, more than in others. If the girth increment is adversely affected due to tapping this may result in the lowering of future yields. This aspect has to be kept in mind to evaluate the performance of these clones in the future.

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REFERENCES

FERNANDO, D. M. (1977). Some aspects of *Hevea* breeding and selection. *J. Rubb. Res. Inst. Sri Lanka* **54** : 17 — 32.

DE SOYZA, A. G. A. and SAMARANAYAKE, CHANDRA (1983). Effect of puncture vs. conventional tapping on the yield and girth of *Hevea*. *J. Rubb. Res. Inst. Sri Lanka* **54** : 07 - 16.

JAYASEKERA (1987). Personal communication.

SAMARANAYAKE, CHANDRA and DE SOYZA, A. G. A. (1984). Studies on exploitation of newer clones in Sri Lanka *Proc. Int. Rubb. Conf. Sri Lanka.* 193 - 205.

SAMARANAYAKE, CHANDRA (1985). Puncture tapping of *Hevea brasiliensis* in comparison with conventional excision tapping. Sri Lanka Experience. *Proc. Int. Rubber Conf. Kuala Lumpur.*

WAIDYANATHA, U. P. DE S. and ANGAMMANA, D. K. (1981). Early exploitation of *Hevea* rubber trees by puncture tapping and short cut tappings. *Expl. Agric.* **17** : 303 - 309.

WAIDYANATHA, U. P. DE S., SAMARANAYAKE, CHANDRA, DE SOYZA, A. G. A. and PERERA, M. C. (1983), virgin bark tapping of RRIC 100, RRIC 101 and RRIC 103. *J. Rubb. Res. Inst. Sri Lanka* **61** : 17 - 24.