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EFFECT OF RECOVERY TAPPING ON YIELD POTENTIAL OF RUBBER (*HEVEA BRASILIENSIS*) TREES

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ABSTRACT

Wet tapping panels are not tapped as it leads to panel diseases, law yields (drying of panels) and wastage of latex. Therefore depending on the area of the cultivation ca. *15 – 34% of the crop is lost each year. Amongst the different agrotechnologies recommended to overcome this crop loss, recovery tapping is frequently done in both plantations and smallholdings. In this study the effect of 0(RT-0), 3(RT-3), 4(RT-4), and 5(RT-5) recovery tappings/tree/month on yield and some yield related parameters of two widely grown clones was tested.*

Total dry rubber yield per tree per month was highest in RT-5 and lowest in RT-0 during first two months of the study. On the third month the RT-0 gave the highest yield/tree/month in clone RRIC 100 whilst in RRIC 121, RT-5 recorded a marginally high yield.

During the initial two months of the study all treatments with recovery tapping recorded a higher g/t/t than from the no recovery tapping treatment in both clones. However, in the third month of the study treatments with recovery tapping recorded a significantly lower g/t/t in clone RRIC 100. In RRIC 121 though the g/t/t was low, the difference was not significant. Excessive recovery tapping continuously for periods more than 2 months resulted in significantly lower latex volumes and DRC. These can be attributed to the lower g/t/t and monthly total yields with excessive recovery tapping. The yield per unit bark consumed also declines when excessive recovery tapping is undertaken.

It can therefore be concluded that recovery tapping when done excessively will not result in higher yields than what can be achieved with the recommended number of recovery tappings. Also

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there is evidence that some clones, e.g. RRIC 121 may withstand relatively more number of recovery tappings a month than others.

Key words: latex volume, recovery tapping, rubber, tapping intensity, yield

INTRODUCTION

Over 94 percent of total rubber extent in Sri Lanka is located in low country wet zone (WL). The total annual rainfall in this area is *ca.* 3000 – 4000 mm (Arjuna's Atlas of Sri Lanka, 1997) and it is well distributed during the year. This is essential for the establishment and early growth of rubber trees. However, a high and a well-distributed rainfall can interfere the tapping process, badly.

The mean number of tapping days recorded during the year 1998 in some major rubber growing areas of the country are given in Table 1. The crop loss on a late tapping (LT) and a washout (WO) day is *ca.* 25 and 50% respectively (Satuthananthavale, 1973), and the estimated loss in the annual crop (%) for these areas are also given in the same table.

Table 1. *The mean number of tapping days recorded during the year 1998 in some major rubber growing areas of the country (NT= normal tapping; LT= late tapping; WO = washouts; NOT= no tapping)*

Area	NT	LT	WO	NOT	% Loss in annual crop
Kurunagala	233	41	7	84	15
Kegalle	223	37	26	81	28
Avissawella	212	64	12	76	27
Galle	207	48	6	108	34
Kalutara	204	55	13	91	31
Ratnapura	198	65	5	96	32

(Source: Nugawela, 1999)

It is apparent that wet weather conditions result in significant crop losses. Further, it affects tapper productivity resulting in a poor monthly wage for tappers. Use of rainguards and undertaking recovery tapping are the major ways to minimize crop loss due to interference of rain. However, use of rainguards is a process, which will incur relatively higher costs than recovery tapping. Further, correct fixing of rainguards demands skilled labour. Therefore, recovery tapping is preferred to the use of rainguards in many plantations and smallholdings. However, recovery tapping when done excessively, can exceed in certain matter, the highest possible tapping intensity recommended, *i.e.* 100% in which rubber trees could be exploited (Nugawela, 1995). Therefore, this study was aimed to investigate the effect of the different frequencies of recovery tapping on yield potential of rubber trees in different clones.

MATERIALS AND METHODS

Experimental area and selection of plant material

A clearing planted in 1986 with clones RRIC 100 and RRIC 121 separately, at Dartonfield Group, Rubber Research Institute, Agalawatta was selected for the study. Tapping in both clones were commenced in 1992 and were tapped on ½ S d/2 system from the second year of tapping.

In a normal tapping day, the individual tree yields were measured in the field and 40 trees were selected from each clone on the basis of yield uniformity. The 40 plants selected from each clone were separated into 4 groups randomly, each group having 10 trees.

Treatments

The following treatments of recovery tapping were assigned randomly to the four groups of trees (Table 2).

Table 2. *Treatments tested on clones RRIC 100 and RRIC 121*

Treatment	Tapping system	No. of recovery tappings (RT) per month per tree
1 (RT-0)	½ S d/2	0
2 (RT-3)	½ S d/2+RT	3
3 (RT-4)	½ S d/2 + RT	4
4 (RT-5)	½ S d/2 + RT	5

Measurements

In each clone, the 4 groups of plants selected were tapped according to the treatments assigned and the dry rubber yield per tree per tapping (g/t/t) was recorded. The dry rubber yield per tree per tapping was calculated from the latex volume (LV) and dry rubber content (DRC). The total bark consumed in each treatment during the period of study was also measured. Total yield of each treatment during the period November and December 1997, was divided by the total bark (cm) consumed and number of trees tapped during the same months to find out the yield per tree per unit bark consumed. Actual tapping intensity for the each treatment was calculated as described by Sethuraj, (1992).

RESULTS

Latex volume (LV)

Mean volume of latex per tree per month from recovery tapping treatments was significantly higher than in the treatments with no recovery tapping during October and November (Fig.1). However, this difference was not apparent during the last month of the study *i.e.* December. Both clones, *i.e.* RRIC 100 and RRIC 121 behaved similarly.

Dry Rubber Content (DRC)

In both clones, the DRC of the trees with no recovery tapping was higher than the trees subjected to recovery tapping (Fig. 2). Further, the DRC had dropped gradually during the period of study and the drop in DRC was more prominent in the clone RRIC 100.

Yield per tree per tapping (g/t/t)

Dry rubber yield per tree per tapping was similar among the treatments in both clones during the first two months of the study. During the third month of the experiment the g/t/t was significantly higher in trees with no recovery tapping in clone RRIC 100. But this difference was not significant in RRIC 121 (Fig.3).

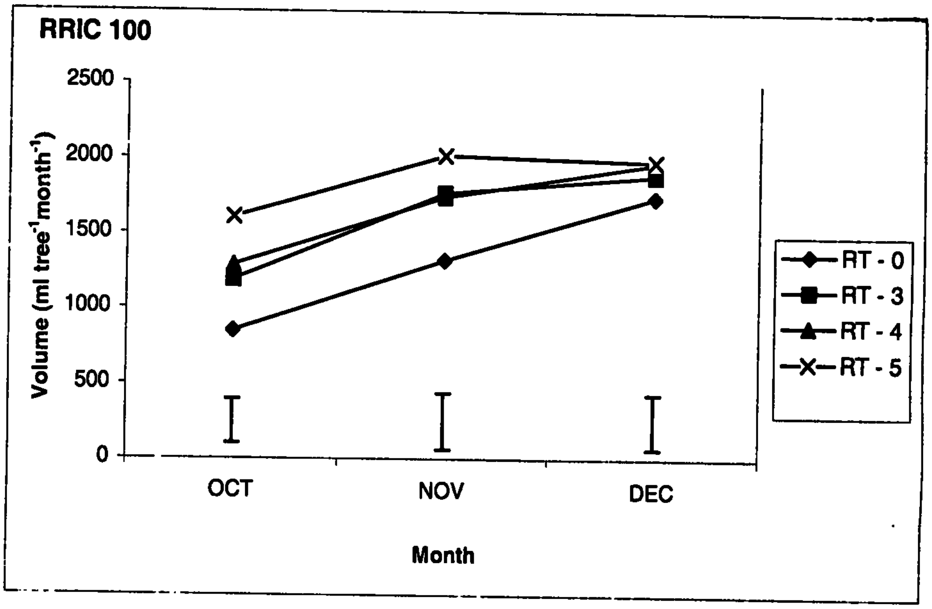
Total yield per tree per month

The monthly total yield/tree was higher in treatment 4 and lowest in treatment 1 (Fig.4). However, yield differences were significant only during the first month and the treatment differences became less apparent in subsequent months. In RRIC 100 the yield of treatment 1 was higher than in treatment 4 in the month of December (Fig.4).

The total yield harvested per tree under different frequencies of recovery tapping during the period of study was not significantly different in both clones tested (Fig. 5).

Bark consumption rate and the yield per unit bark consumed

The total bark consumed during the period November and December was significantly higher in treatment 4 and was lowest in treatment 1 (Table 3). In both clones the yield per unit bark consumed was highest in treatment 1 (Table 4).



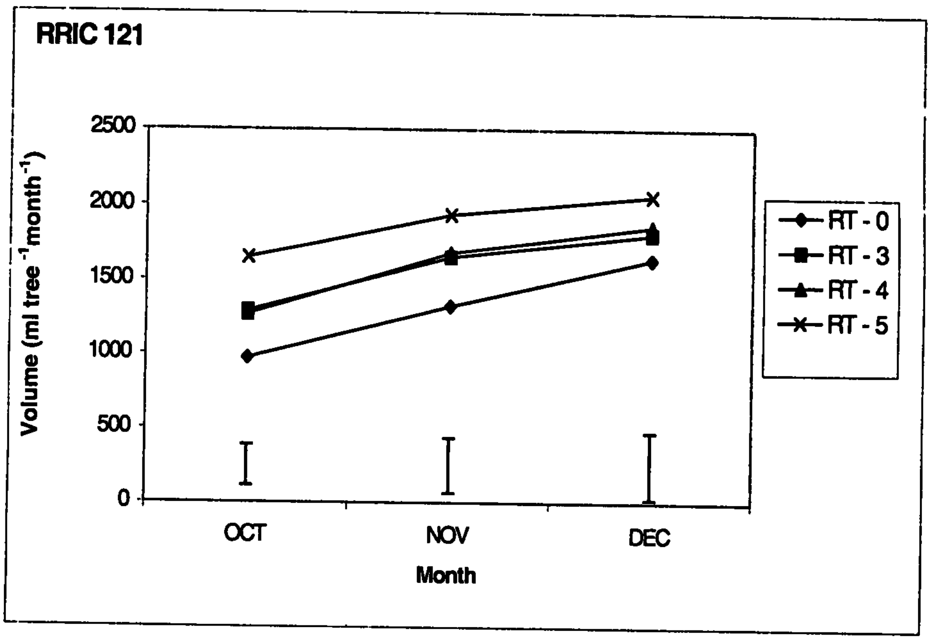
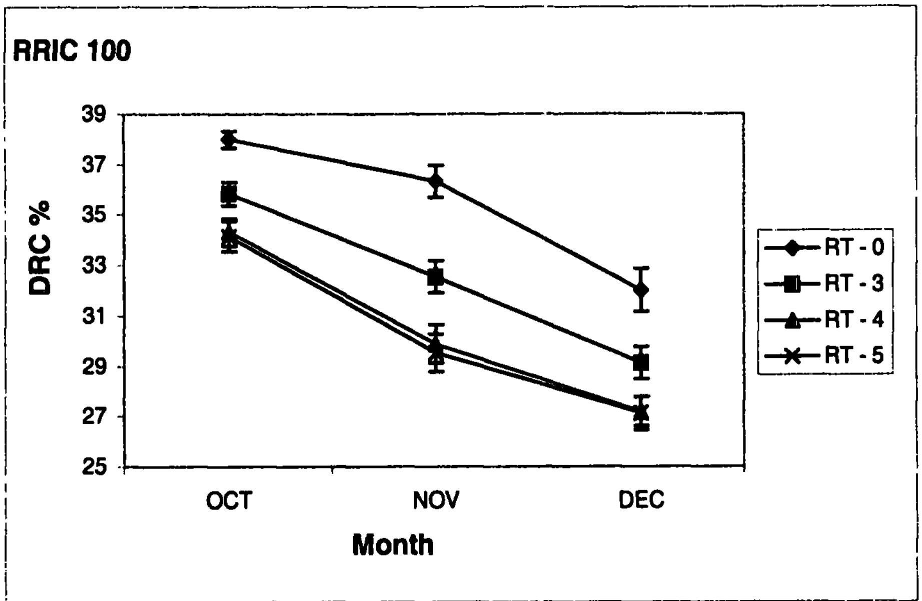


Fig.1. Monthly latex volume (ml) per tree under different frequencies of recovery tapping in clones RRIC 100 and RRIC 121. Vertical bars represent the LSD (0.05) for comparing treatments

Effect of recovery tapping on yield



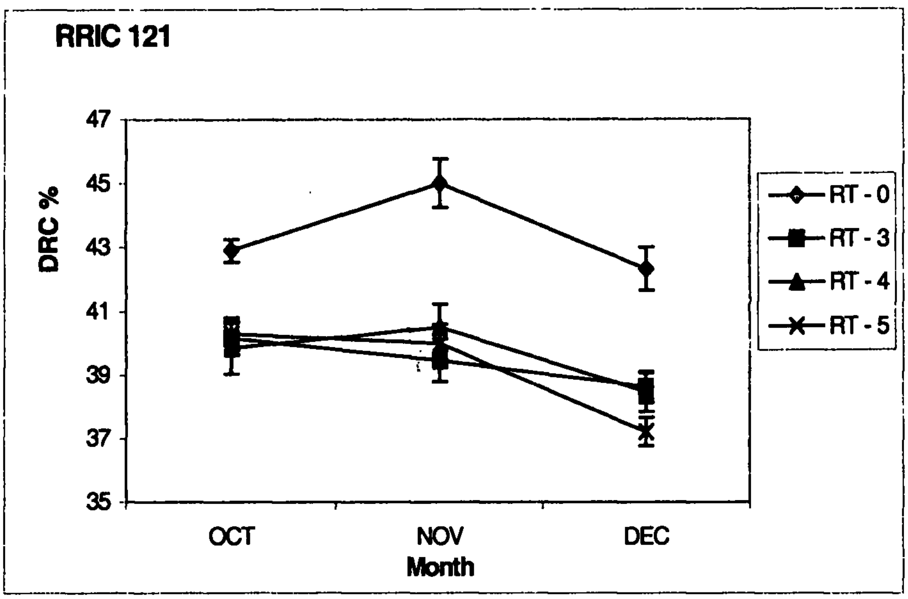
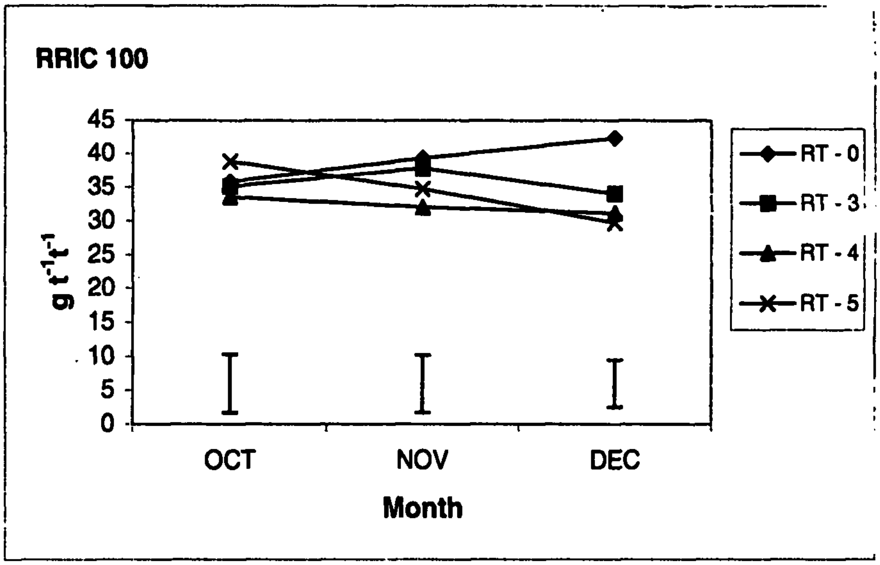


Fig.2. Mean DRC of latex under different frequencies of recovery tapping in clones RRIC 100 and RRIC 121. Vertical bars represent the Standard Error for comparing treatments.



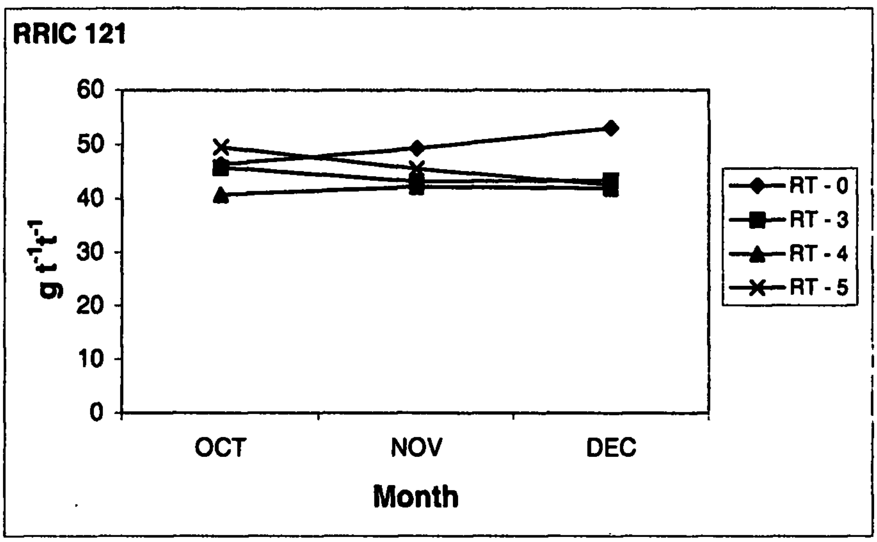
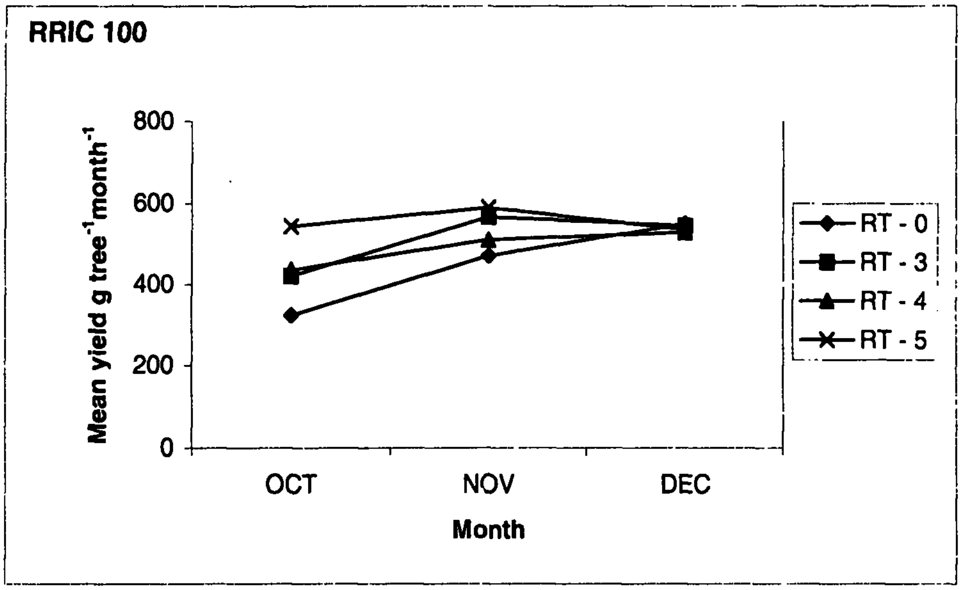


Fig. 3. Mean g/t/t under different frequencies of recovery tapping in clones RRIC 100 and RRIC 121. Vertical bars represent the LSD (0.05) for comparing treatments



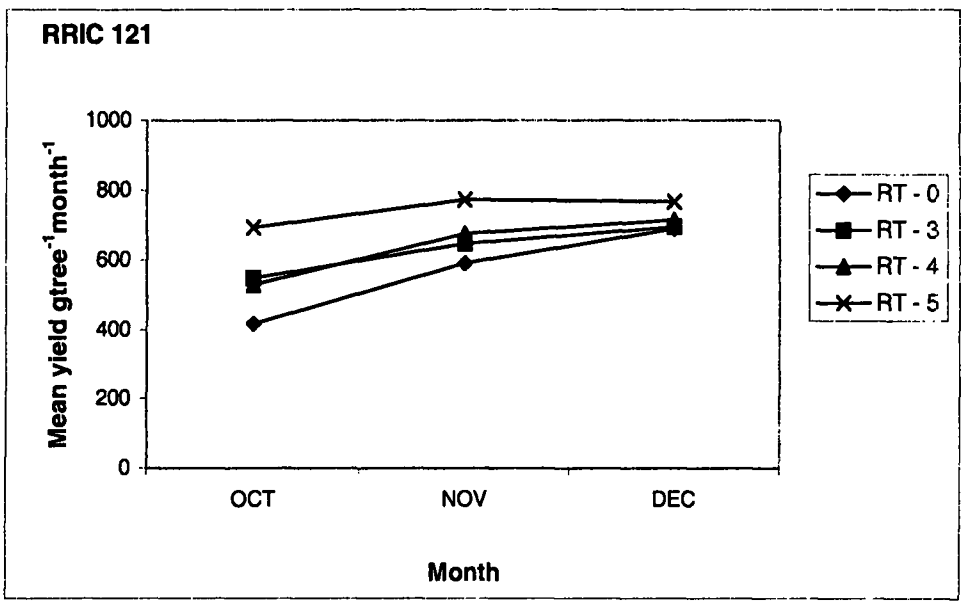


Fig. 4. Mean monthly yield (grams) per tree under different frequencies of recovery tapping in clones RRIC 100 and RRIC 121. Vertical bars represent the LSD (0.05) for comparing treatments

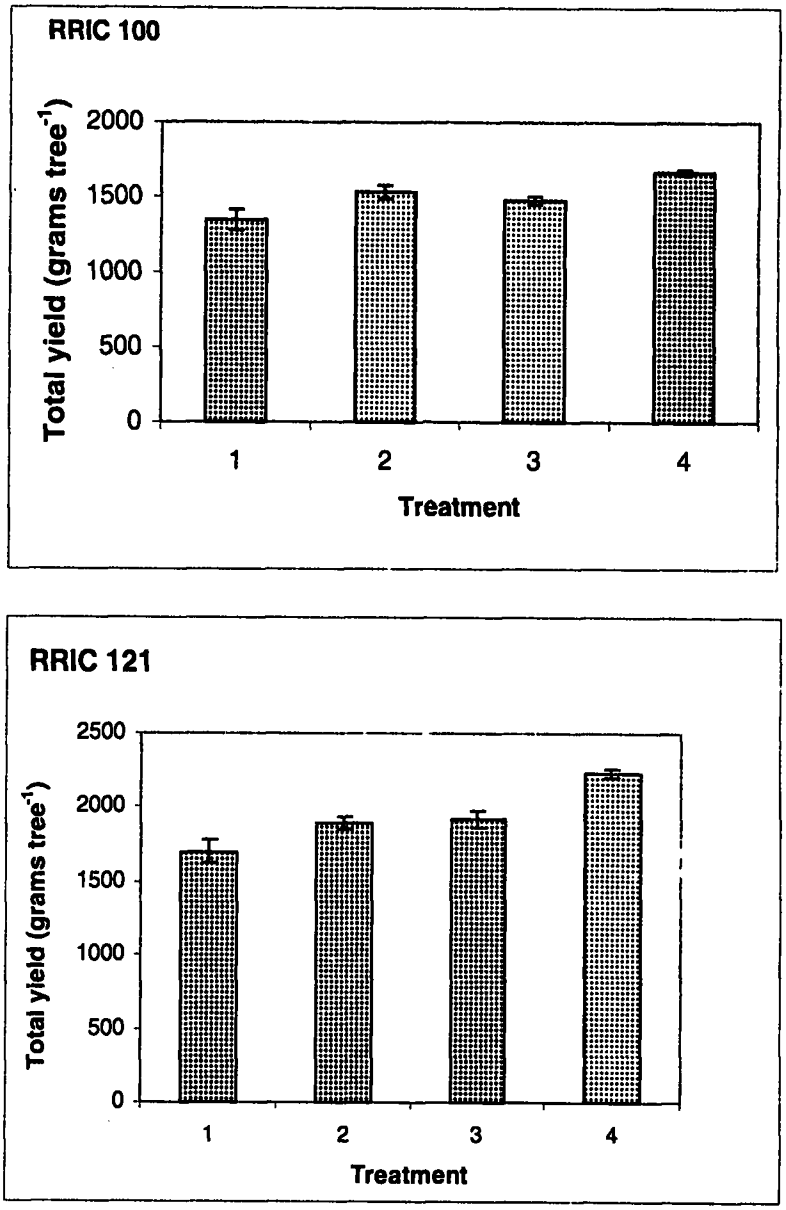


Fig.5. Total yield harvested per tree under different frequencies of recovery tapping in clones RRIC 100 and RRIC 121. Vertical bars represent the Standard Error for comparing treatments

Effect of recovery tapping on yield

Table 3. *The total bark consumed (cm) during November and December in clones RRIC 100 and RRIC 121 as affected by different frequencies of recovery tapping (Means with same letter are not significantly different).*

Treatment	RRIC 100	RRIC 121
1	4.04^{c}	4.52^{c}
2	4.76^{b}	5.00^{cb}
3	5.10^{ba}	5.36^{ba}
4	5.54^{a}	5.55^{a}
F value	9.34	6.29
Pr>F	0.0001	0.0015
C.V.	13.46664	11.18631

Table 4. *The yield (grams) per tree per unit bark (cm) consumed in clones RRIC 100 and RRIC 121 as affected by different frequencies of recovery tapping*

Treatment	**RRIC 100**	**RRIC 121**
1	252.9	283.1
2	233.4	268.5
3	203.9	258.9
4	203.8	277.0

Actual tapping intensity

The actual tapping intensity exceeded the highest recommended, *i.e.* 100% during November and December in recovery tapping treatments (Table 5).

Table 5. *Actual tapping intensity in different treatments in clones RRIC 100 and RRIC 121 during the period of study*

	Month		
Treatment	**October**	**November**	**December**
1	60	80	87
2	80	100	107
3	87	107	113
4	93	113	120

Relationship between tapping intensity and yield related parameters

In both clones a significant negative correlation was evident between DRC and tapping intensity (Fig. 6a). Anyhow, the decline in DRC with tapping intensity was relatively higher in clone RRIC 100 than in clone RRIC 121. A significant positive correlation was evident between monthly latex volume and tapping intensity

(Fig. 6b). The increase in latex volume with tapping intensity was similar in both clones. A negative correlation was evident between g/t/t and tapping intensity (Fig. 7a). However, this correlation was not significant. In both clones, there was evidence for a significant positive correlation between yield/tree/month (y/t/m) and tapping intensity (TI). Further, the increase in y/t/m with tapping intensity was higher in clone RRIC 100 than in clone RRIC 121 (Fig. 7b).

DISCUSSION

Wet weather has made an uncertainty in the natural rubber industry. Therefore, various methods are adopted to overcome this situation. Recovery tapping is the most widely adopted method in rubber plantations to recover the crop loss due to interference of rain. However, many planters and smallholders tend to exceed the maximum number of recovery tappings recommended. Therefore, a sound knowledge on the effect of correct and excessive recovery tapping on the yield potential of trees is important to adopt methods to harvest highest yields at lowest costs during the economic life period of the rubber tree.

The volume of latex per tree per tapping given by the recovery tapping treatments were significantly higher than the treatment with no recovery tapping only during the first two months, *i.e.* October and November of the study (Fig. 1). In contrast, the DRC was significantly higher in the trees with no recovery tapping than in the trees with recovery tapping during the entire period of study (Fig.2). The DRC of the latex in the tree is determined by the inherent biosynthetic capacity of laticiferous system and by the exploitation systems adopted (Sethuraj, 1992). In the present study the difference in DRC among treatments was influenced mainly by the exploitation system as genotypes and other environmental factors remained same. Relatively low latex volume and low tapping intensity (60%) would have been the causes for lower g/t/t in the trees with no recovery tapping during the first month of the study. Generally, the relative tapping intensity was higher in trees with recovery tapping than in the trees with no recovery tapping and a relatively higher tapping intensity results in a lower DRC. Further relatively higher DRC and volume of latex resulted in higher g/t/t in trees with no recovery tapping than in the trees with recovery tapping during the latter period of the study, *i.e.* months of November and December.

The monthly total yield was highest in RT-5 and lowest in RT-0 in both clones during the period of study. However, the yield difference was not significant in the latter part of the study (Fig.4). Reason for this would be a significant and a steady decline in DRC evident with increasing tapping intensity (Fig.6a). One additional tapping *i.e.* a recovery tapping, increased the relative tapping intensity during the month by *ca.* 7% (Table 5). Increased tapping intensity results in a decrease in DRC (Paardekooper, 1989). Further, considering DRC as a physiological indicator: a low value of it (below 30 per cent) may indicate that the tree is probably 'over exploited'. This phenomenon is supported by the declining trend in yield with recovery tapping during latter part of the experiment. However, the decline in DRC was less in RRIC 121 than in RRIC 100. Therefore, it is evident that clone RRIC 121 is capable in maintaining the g/t/t with recovery tapping than clone RRIC 100. Although this gives an indication of greater resistance of RRIC 121 than RRIC 100 for recovery tapping, further long-term studies should be carried out to arrive at a firm conclusion.

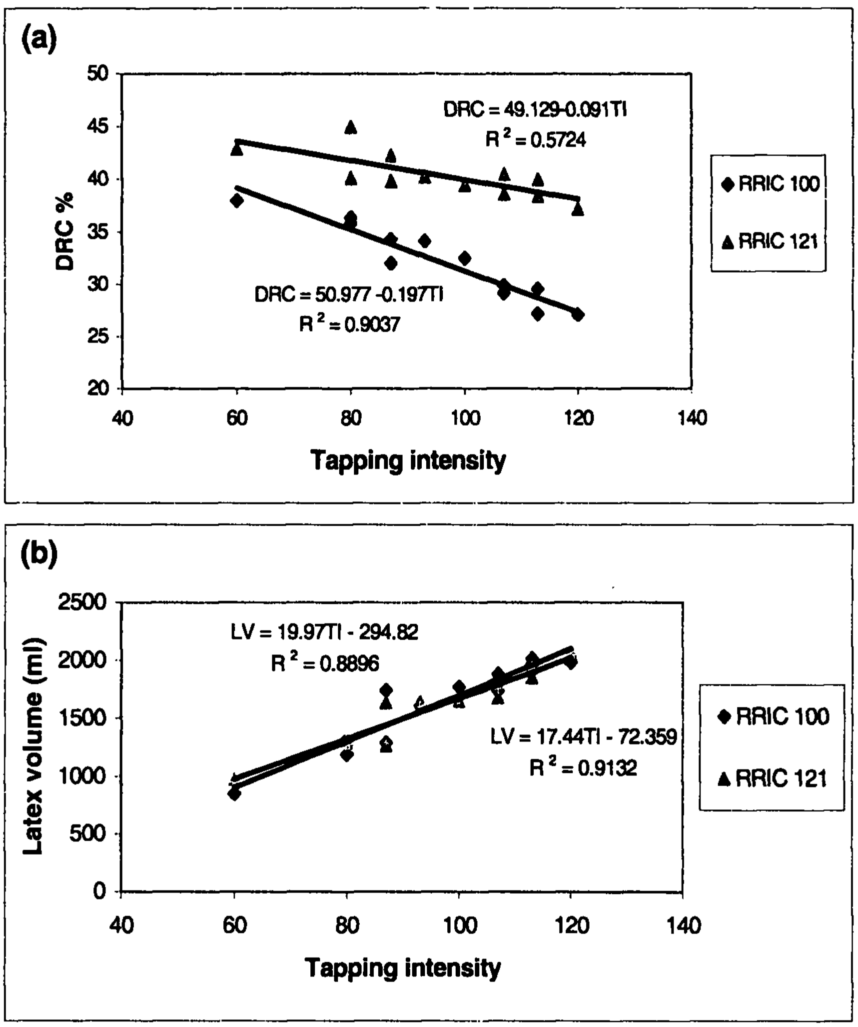
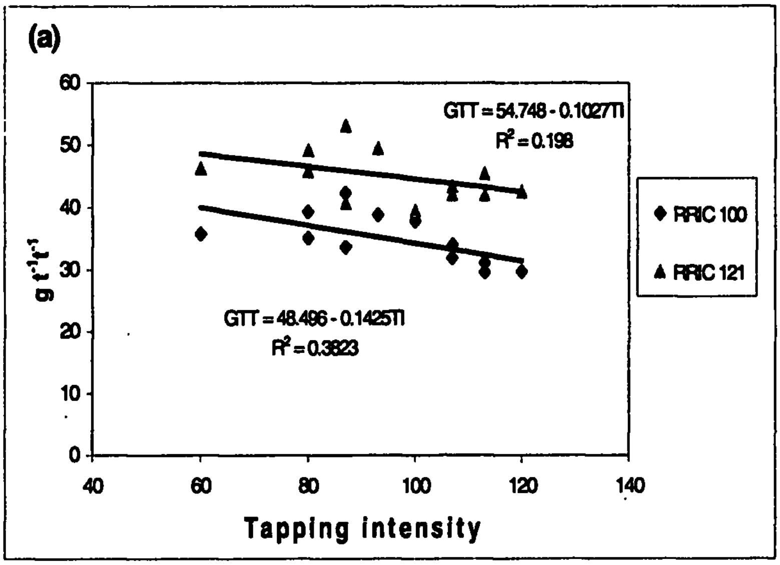


Fig. 6. Relationship between tapping intensity and (a) DRC (b) latex volume (ml) in clones RRIC 100 and RRIC 121



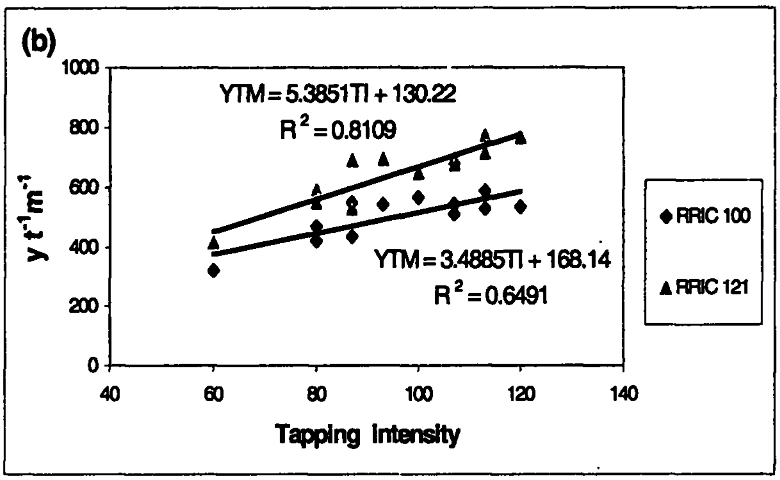


Fig.7. Relationship between tapping intensity and (a) grams per tree per tapping (g/t/t) (b) yield per tree per month (y/t/m) in clones RRIC 100 and RRIC 121

The total bark consumed during the period of study was significantly higher in RT-5 than in RT-0 in both clones (Table 3). Anyhow, the yield per unit of bark consumed was highest in RT-0 (Table 4). This indicate that excessive recovery tapping leads to rapid removal of bark, and thereby affecting the cumulative yield during the economic life span of the tree. Further, shorter tapping cycles will affect the ratio of productive/unproductive extent of a plantation. The repeated removal of large quantities of latex, *i.e.* over exploitation, with the consequence of fluctuating the water availability in the bark could be responsible for the development of TPD (Wickramasinghe, 1986; Sharples & Lambourne, 1924). Therefore, excessive recovery tapping may increase the incidence of this disorder.

This study shows that the total yield obtained during the three months period of the study was highest in RT-5 while lowest in RT-0. Anyhow, the yield differences were not significant among treatments during the latter part of the study. Although recovery tapping can be used to recover the crop loss resulting from interference of rain, the crop recovered will highly depend on DRC and latex volume which are dependent on tapping intensity. Further, with recovery tapping during dry months the tapping intensity can exceed 100%, resulting in lowering of the yield potential of trees. When the tapping cost is the largest component in the cost of production (Westgarth & Narayan, 1964) the additional yields from recovery tapping is associated with increase in cost due to low intake per tapper. Such recovery tapping is not always economically justified (Paardekooper, 1989). Therefore in depth economic analysis has to be under taken to arrive at firm conclusions. Also further, attention should be given to investigate the clonal specific responses and brown bast incidence on long term basis.

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