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PERFORMANCE OF MINI AND REDUCED SPIRAL TAPPING CUTS IN *HEVEA BRASILIENSIS*

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ABSTRACT

India is fourth in natural rubber production and area under rubber is around 5.6 lakh hectares of which 87% is in small holdings and only 13% is in estate sector. Rubber plantation industry in India is facing crisis for the last few years and the present price is not cost effective. Due to high frequency of tapping and associated incidence of TPD in the small holdings, economic life is restricted to 13-15 years. At the same time, estates are following medium frequency of tapping. Due to higher wage rates, poor labour efficiency and over heads, cost of production is more in the estate sector. The way out for rubber grower is to make his product more cost effective. Optimum dose and frequency of application of ethepon, an yield stimulant, can help in realizing potential crop from rubber trees.

An experiment was laid out to compare the performance of mini and reduced spiral cuts under d/3 frequency of tapping in clone RRII 105, the Indian Wonder Clone, with different frequencies of stimulation. Seven tapping treatments comprising different cut length, frequency and dose of stimulation were imposed with completely randomized design (single tree, single plot).

In the present experiment, comparable or better yield could be realized from mini and reduced spiral cuts. Dry rubber content and girth increment were also more and the incidence of TPD was less. These approaches can substantially reduce cost of production of natural rubber through increasing task, economic life and reducing the requirement of skill for tapping. Tapping of short tapping cuts can maximize physiological efficiency with minimum injury to the laticiferous system

INTRODUCTION

Natural rubber trees (*Hevea brasiliensis*) are native of the rain forests of Tropical America and are now grown in organized plantations as well, in South and South East Asia (Jones and Allen, 1992). The basic method of systematic crop extraction by tapping, a biotic stress, is the contribution of Henry Ridley made as early as 1890-91. Since then, efforts are being made to improve the process of exploitation (crop harvesting) to the optimum level of physiological efficiency of different clones. The objective of good tapping always should be to get as much crop as possible from trees with minimum excision of bark, lowest interference with health of trees, their capacity for sustainable rubber production at lower tapping cost and less incidence of Tapping Panel Dryness (TPD), formerly known as brown bast (Baptiste, 1962, Vijayakumar et al,2000 b) . Minimising of excision can be achieved either by lower frequency of tapping or by reducing the length of tapping cut (Vijayakumar *et al*, 2000 a).

India is fourth in natural rubber production. In rubber plantation industry, two groups, small holdings and estates, can be distinguished. In India, area under rubber is around 5.6 lakh hectares of which 87% is in small holdings and only 13% is in estate sector (Rubber Board, 1999). Rubber plantation industry in India is facing crisis

for the last few years, and it may remain unchanged. For both the categories, the present price is not cost effective. Due to high frequency of tapping and associated incidence of TPD in the small holdings, economic life is restricted to 13-15 years. Majority of these growers are exploiting crop only from the virgin basal panels and then slaughter tap for 2-3 years. At the same time, estates are following medium frequency of tapping. Due to higher wage rates, poor labour efficiency and over heads, cost of production is more in the estate sector. The way out for rubber grower is to make his product more cost effective (Vijayakumar et al, 2000 b). Tapping cost is the largest single item in the cost of production (Westgarth and Narayanan, 1964). Hence, considerable reduction of this has to be attempted. Though ethepon (2 - chloroethyl phosphonic acid) is a common yield stimulant, unscrupulous use of it (at high concentration, dose etc) can subject trees to stress (Sulochanamma and Thomas, 2000). But optimum dose and frequency of application of it can help in realizing crop from trees under lower frequency tapping with third or fourth daily or weekly tapping (Thanh et al, 1996). Similarly potential crop can be extracted by stimulating mini (5cm cut) or reduced spiral cuts (Lukman, 1995). Combination of low frequency and short tapping cut is also feasible. Low intensity systems are not sustainable without yield stimulation (Lee, 1989) and hence trees are stimulated from virgin panel itself. These approaches can substantially reduce cost of production of natural rubber through increasing task, economic life and reducing the requirement of skill for tapping. Tapping of short tapping cuts can maximise physiological efficiency with minimum injury to the laticiferous system.

An experiment was laid out to compare the performance of mini and reduced spiral cuts under d/3 frequency of tapping in clone RRII 105, the Indian Wonder Clone, with different frequencies of stimulation.

MATERIALS AND METHODS

The experiment was laid out during 1998 in the experimental farm unit of RRII located at Pampady (9° 32' N latitude, 76° 36' E longitude, 65m MSL) in clone RRII 105. All the trees were opened for tapping at 125cm from bud union on BO-1 panel and were rainguarded. Seven tapping treatments comprising different cut length, frequency and dose of stimulation (Table.1) were imposed with Completely Randomized Design (single tree, single plot). The panel width in different treatments were 1/2S, 1/3S, 1/4S, 10cm (reduced spiral) and 5cm (mini cut) and the corresponding length of tapping cut is shown in Table 3. Yield stimulant, ethepon at 2.5% or 5% a.i. was applied on freshly tapped panel (Table.1). The actual tapping intensity under all the treatments were worked out based on actual number of tapping days realised in an year (Lukman, 1983) and are substantially lower than the recommended practice, 1/2S d/3 6d/7 (55%). Dry Rubber Yield (g tree-1 tap-1)was recorded for each tapping. Dry rubber content (drc), Tapping Panel Dryness (TPD) , annual girth increment and bark consumption are the other parameters monitored. Maintenance of the prescribed panel width of tapping cut was checked periodically.

RESULTS AND DISCUSSION

Results of the present investigation are presented in Tables 2, 3 and Fig. 1. Data on annual dry rubber yield (Kg ha-1) and mean

Table 1. Details of treatments showing different panel width, stimulation dosage and frequencies

Treat-ments	Particulars
T0	1/2S d/3 6d/7 – No stimulation
T1	Mc 5 d/3 6d/7 ET 2.5% Pa 24/y
T2	Mc 5 d/3 6d/7 ET 5.0% Pa 12/y
T3	S/R 10 d/3 6d/7 ET 2.5% Pa 24/y
T4	S/R 10 d/3 6d/7 ET 5.0% Pa 12/y
T5	1/4S d/3 6d/7 ET 2.5% Pa 12/y
T6	1/3S d/3 6d/7 ET 2.5% Pa 12/y

Note:

Mc 5 - Minicut of 5cm length; S/R10 - Reduced spiral cut of 10cm length; 1/4S - Quarter spiral cut ; 1/3S - One-third spiral cut; ET - Ethepon ; Pa - Panel application

Table 2. Yield performance (Kg ha - 1), girth increment (%) and TPD incidence under mini and reduced spiral tapping cuts in *Hevea brasiliensis* - clone RRII 105 (panel BO-1).

Treatments	Annual yield (kg/Ha)*	girth increment (%) ++	Number of TPD trees
T0 - 1/2S d/3 6d/7 (Control)	2135 (100)	6.10	1
T1- Mc5 d/3 6d/7 ET2.5% pa 24/y	1721 (81)	9.67	0
T2 - Mc5 d/3 6d/7 ET 5% pa 12/y	1550 (73)	10.20	0
T3 - S/R10 d/3 6d/7 ET2.5% pa 24/y	2727 (128)	8.00	0
T4 - S/R10 d/3 6d/7 ET5% pa 12/y	2354 (110)	6.80	0
T5 - 1/4S d/3 6d/7 ET 5% pa 12/y	2679 (126)	7.91	0
T6 - 1/3S d/3 6d/7 ET 5% pa 12/y	2813 (132)	8.18	0

* CD at 5 % = 462.05; ‡ CD range at 5% = 2.51 to 2.84; Figures in parenthesis indicate percentage

monthly yield (g tree-1 tap-1) are given in table 2. Yield obtained under short tapping cuts except mini cuts (5cm) are higher than the control (10-32 percent). Even from mini cut of 5cm, by fortnightly application of ethepon at 2.5%, yield obtained was 81 percent of the 1/2S d/3 control. This can possibly be increased by further increase in frequency of ethepon application. Pretreatment girth of all the trees selected for the experiments were comparable. However, the annual girth increment was higher in the trees with short tapping cuts (7-10%) than in half spiral cuts (Table 2). Though not statistically significant, mean annual dry rubber content (Figure 2) was also higher (37-40%). Length of tapping cut did not have any influence on bark consumption (1.8 cm month-1). So far, one control tree only was affected by TPD (Table 2).

Depending on the width of panel, number of possible panels in the virgin bark can be upto 10 (Table 3). With an average of 5 years of tapping per panel, possible duration of tapping on virgin basal panels itself could be upto 50 years (5cm mini cut). Actual tapping intensity was as low as 11 % for 5cm mini cut and 37% for 1/3S, whereas it was 55% for the 1/2S control (Table 3).

The economic life of rubber tree depends mainly on the tapping systems in practice. It can be lengthened by adopting low intensity tapping frequency with stimulation. In the present experiment, comparable or better yield could be realized from mini and reduced spiral cuts. Dry rubber content and girth increment were also more and the incidence of TPD was less. In India, one-third spiral cut (1/3S) was found successful (Rubber Research Institute of India, 1993).

Table 3. Actual tapping intensity (%), length of tapping cut, number of Virgin panels and possible years of tapping under mini and reduced spiral tapping cuts in *Hevea brasiliensis* - clone RRII 105 (panel BO-1).

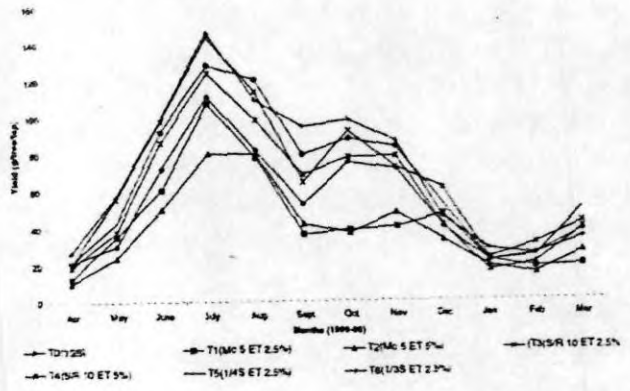
Treatments		Length of tapping cut (cm)	Number of virgin panels	Possible years of tapping
T0 - 1/2S d/3 6d/7	55	30	2	10
T1 - Mc5 d/3 6d/7 ET2.5% pa 24/y	11	9	10	50
T2 - Mc5 d/3 6d/7 ET 5% pa 12/y	11	9	10	50
T3 - S/R10 d/3 6d/7 ET2.5% pa 24/y	22	13	5	25
T4 - S/R10 d/3 6d/7 ET5% pa 12/y	22	12	5	25
T5 - 1/4S d/3 6d/7 ET 5% pa 12/y	27	16	4	20
T6 - 1/3S 10 d/3 6d/7 ET 5% pa 12/y	37	20	3	16

Kuswanhadi and Junaidi (1986) made similar reports from 1/4S, 1/3S and 1/6S tapping cut with stimulation than 1/2S d/2 from studies conducted in South Sumatra. Short tapping cut such as 1/4S and 1/3S with stimulation is a recommended practice for marginal farmers (Kuswanhadi, 1989).

The action of all yield stimulants is mediated through ethylene production, endogenously or through hydrolytic decomposition. Very short tapping cuts are not sustainable without yield stimulation (Lee, 1989). Reduction in panel width increases the rate of plugging of the latex vessels (Gomez, 1983). Stimulation reduces the rate of plug formation and increases the duration of flow with subsequent increase in drainage area (Pakinathan and Milford, 1977). Trees tapped on short tapping cuts with judicious stimulation are tuned for enhanced biosynthesis and result in higher equilibrium for yield..

Judicious use of ethepon under low tapping intensity will help in extracting crop equivalent to

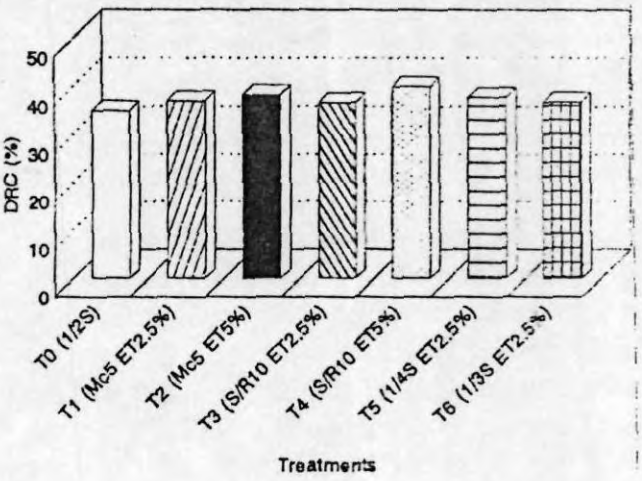
Fig. 1. Monthly yield (g/tree/tap) variation under mini and reduced spiral cuts in Hevea brasiliensis (clone RRII 105, Panel - B-1)



physiological efficiency of the clone. Such extraction of sustainable crop, though with the aid of ethepon, cannot create any additional stress to the trees as is evident from the present study. Yield obtained from 5cm mini cut was 81 percent of the control (half spiral cut). Reduced spiral cuts of 10cm, 1/4S and 1/3S gave significantly higher yield (10-32%) than control. Higher drc than that of control under all treatments indicates better vigor of the plants with short tapping cuts. This is further evidenced by higher girth increment and low incidence of Tapping panel dryness.

By adopting short tapping cuts, the size of the tapping task can be increased up to 500 trees from the present task of 300 trees with significant

Fig. 2. Dry rubber content (%) under mini and reduced spiral tapping cuts in *Hevea Brasiliensis* (Clone RRII 105 - panel BO-1).



reduction in tapping cost. Indirectly, the cost of production will be further reduced by increasing the economic life of trees (3 to 10 virgin panels - 15 to 50 years of tapping) . Moreover, as short tapping cuts are less injurious, even semi skilled workers can also be employed for tapping. Hence, mini or reduced spiral cuts can be adopted as an immediate measure to make rubber more cost effective under the present scenario.

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