Journal of Plantation Crops 18 (Supplement) : 342-346

EFFECTS OF DIFFERENT EXPLOITATION SYSTEMS ON YIELD AND BROWNBAST INCIDENCE IN RRII 105, A HIGH YIELDING CLONE DURING BO-1 PANEL STAGE

S. SULOCHANAMMA, K. U. THOMAS and K. R. VIJAYAKUMAR
Rubber Research Institute of India, Kottayam 686 009, Kerala, India

ABSTRACT

Two tapping systems are compared with conventional ½ S d/2 6 d/7 control system in RRII 105 on virgin bark stage. The systems of tappings studied are ½ S d/3 6 d/7 and 2 x ¼ S ↑ ↓ d/2 6 d/7(t, t). Yield, girth, d.r.c., Plugging index and brownbast incidence were recorded during the initial two years. Yield under third daily tapping system was around 24% less when compared to alternate daily tapping system during the first year and 15% less in the second year. The lowest yields were recorded for quarter spiral change over system. However, plugging index was also higher for the d/3 system of tapping. There was no significant difference in the yields of dry rubber from upward and downward tapped quarter cuts. In the incidence of brownbast also there were no significant differences in the plots under different tapping systems. Similarly there was no difference in the incidence of brown bast in the upward and downward tapped quarter cuts. Girth increments were similar in trees under the different tapping systems.

INTRODUCTION

The exploitation method is an important factor in determining the yield in *Hevea*. Many tapping systems have been evolved through research during the past years. Both longer tapping cuts and more frequent tappings increase yields in the initial periods but may cause subsequent reduction because of increase in the incidence of brownbast as well as decrease in girth increment. Usually high yielders are more prone to these factors. An ideal tapping system would be one which gives the highest yield at the satisfactory growth rate and lowest incidence of brownbast along with the lowest tapping cost. But there is no single tapping system that will give the best results on all clones on all conditions. Yield per tapper is important under the condition of low rubber prices and high wages. Hence investigation of exploitation methods to each clone with a view to obtain high yield with few tappings is also very important. Generally brownbast is considered as a physiological disorder due to over exploitation (Paranjothy, Gomez and Yeang, 1975). This phenomenon is an important factor in determining the tapping intensity to a particular clone. It is reported that brownbast increases with increase in tapping intensity (Rands, 1921; Sharples and Lambourne, 1924; Sanderson and Sutcliffe, 1921; Bealing and Chua, 1972). The frequency of tapping is said to have a greater effect than the length of the cut on induction of brownbast (Chua, 1966). Propensity to dryness is related to plugging index which is a clonal character (Milford, Paardekooper and Hochai, 1969).

RRII 105 is a high yielding popular Indian clone (2000 kg/year / ha). High yielding tree responds less to increasing the length of tapping cut because of the larger drainage area (Ng et al., 1969). For RRII 105, the tapping system generally followed is ½ S d/2. However, higher incidence of brownbast is being reported by some growers. It is probable that the incidence of brownbast might be reduced by changing the tapping system without much reduction in the net profit. Adoption of less intensive system is one such possibility. Hence an experiment on this aspect was initiated in 1985.

MATERIALS AND METHODS

A study was taken up at Central Experiment Station, Chethackal in 1985 on RRII 105 (1975 planting) to evaluate the effects of different exploitation methods on yield and brownbast incidence. The plants were of BO – 1 panel stage. The tapping treatments imposed were (1) ½ S d/2 6 d/7 (Control) (half spiral alternate daily tapping) (2) ½ S d/3 6 d/7 (half spiral third daily tapping) (3) 2 x ¼ S ↑↓ d/2 6 d/7 (t, t) (Quartral spiral change over system). The experiment was laid out on a completely randomised design with eight plots in each treatment having 15 trees in each plot. Same tapper was employed for all the treatments to avoid tappers' influence. Yield, dry rubber content, plugging index, girth and brownbast incidences were recorded. Yield was recorded by volume measurement of total latex for the first year and by cup coagulation method afterwards. Girth was recorded at 150 cm height from the bud union.

RESULTS

The results presented in this paper (Tables I and II) show that maximum yield of dry rubber is obtained from trees under ½ S d/2 6 d/7 system of tapping. Though the yield from trees under ½ S d/3 6 d/7 system of tapping was 23.6% in the first year, the difference was reduced to 14.5% during the second year. However, in the ¼ S double cut change over system the yield difference when compared with that of ½ S d/2 system was more in the second year.

Table I. *Yield of latex from clone RRII 105 under different tapping systems during 1986–87*

Tapping systems	Yield of latex (l)/120 trees/year
½ S d/2 6 d/7	2328.94 (100)
½ S d/3 6 d/7	1781.41 (76.49)
2 x ¼ S ↑ ↓ d/2 6d/7 (t, t)	1653.74 (71.01)

Figures within brackets denote yield as percentage of 1/2 S d/2 control.

Table II. *Yield of dry rubber from clone RRII 105 under different tapping systems during 1987–88*

Tapping systems	Yield of dry rubber (Kg/120 trees/year)**
½ S d/2 6 d/7	1160.29 (100)
½ S d/3 6 d/7	992.73 (85.56)
2 x ¼ S ↑ ↓ d/2 6d/7 (t, t)	785.61 (67.71)

C. D. 0.05 7.90

** Significant at 1% error.

(Figures within brackets denote yield as percentage of ½ S d/2 control)

The yield per tapper per tapping was higher for ½ S d/3 6 d/7 and lowest for 2 x ¼ S ↑↓ d/2 6 d/7 (t, t) (Table III).

Table III. *Yield per tapper per tap from clone RRII 105 under different tapping systems during 1987–88*

Tapping systems	Yield/tapper/tap(kg/ 120 trees/year)**
½ S d/2 6 d/7	8.74
½ S d/3 6 d/7	11.03
2 x ¼ S ↑ ↓ d/2 6 d/7	5.55

C. D. 0.05 0.514.

** Significant at 1% error.

Statistical analysis of girth data shows no difference in girth increment for the trees under different treatments (Table IV). The data on dry rubber content shows a lower value for more frequent tapping (Table V).

Table IV. *Girth increment of trees of clone RRII* 105 (1987-88) *under different systems of tapping*

Tapping systems	Girth increment (cm)
½ S d/2 6 d/7	7.72
½ S d/3 6 d/7	7.54
2 x ½ S ↑ ↓ d/2 6 d/7 (t, t)	8.10

N. S.

Table V. *Plugging indices in dry and wet seasons of* 1987 *and the annual mean dry rubber content in clone RRII* 105 *under different systems of tapping*

Tapping system	d.r.c. (%)	Plugging index: Wet season	Plugging index: Dry season
½ S d/2 6 d/7	36.6	2.68	5.46
½ S d/3 6 d/7	40.0	3.16	7.74
2 x ½ S ↑ ↓ d/2 6d/7 (t, t)	41.5	3.55	7.82

The data on plugging indices in wet and dry seasons are presented in Table V. Plugging index was lowest for ½ S d/2 having more frequent tapping and higher for less frequent tapping system.

Data on incidence of brownbast are given in Tables VI and VII. Though not statistically significant, brownbast incidences were higher in plots under ½ S d/2 6 d/7. In double cut change over system eventhough the frequency of tapping was less for the cut than those of the other treatments, there was no significant reduction in the incidence of dry trees.

Table VI. *Incidence of brown bast in clone RRII* 105 *under different systems of tappings for two years*

Tapping system	No. of trees affected/120 trees
½ S d/2 6 d/7	18
½ S d/3 6 d/7	10
2 x ½ S ↑ ↓ d/2 6d/7 (t,t)	13

N.S.

DISCUSSION

The results presented in this paper show that ½ S d/3 6 d/7 system of tapping has a rising trend in yield when compared to ½ S d/2 6 d/7 system. P' Ng and Lee (1970) reported that in PB 5/63 the yield on S/2 d/3 increased rapidly and out yielded the control in course of time. But no such effect was reported in RRIM 600 and GT1 (Gan Lian Ting et al, 1985). In RRII 105 yield per tapper was significantly high for ½ S d/3 6 d/7 system when compared to control (Table III). This agrees with the findings of Gan Lian Ting et al. (1975). The low yield for 2 x ½ S↑↓ d/2 6 d/7 (t, t) is due to the low drainage area, low frequency of tapping and less duration of flow of latex. Eventhough spillage was observed in many cases on the upper cut, statistically there was no significant difference in yield per tap between the two cuts (Table VIII). Though not statistically significant the lower yield recorded for the upper cut may be due to the loss of latex through spillage.

The low plugging index recorded for ½ S d/2 system is because of the higher intensity of tapping. It is also reported that plugging index increases with shortening the cut length (Paardekooper, Langlois and Sompong, 1975). In this experiment the trend remained same for dry and wet seasons.

Table VII. *Incidence of brown bast in the upward and downward cuts in clones RRII 105 under 2 x ¼ S↑↓ d/2 6 d/7 (t,t) system of tapping for two years.*

Affected cuts	No. of cuts/ 120 trees
Upper cut	5
Lower cut	4
Both cuts	4
Total	13

N.S.

Table VIII. *Dry rubber yields from upward and downward cuts in clone RRII 105 under 2 x ¼ S↑↓ d/2 6 d/7 (t, t) system during* 1987-88

Tapping cut on the tree	Dry rubber yield (kg) /20 trees/year
Lower cut	445.61
Upper cut	340.00

N.S.

The data presented here shows that there is an indication that intensity of tapping has a role in the onset of brownbast, only upto a particular low intensity, below which there is no corresponding decrease. This is evidenced by the higher incidence of brownbast in quarter spiral cuts. The absence of significant difference between downward and upward quarter cuts in the incidence of brown bast shows that there may not be any advantage in adopting upward tapping in RRII 105 for tackling the problem of higher brownbast incidence in the clone. This is in contrary with the findings of Sivakumar, Ismail and Abraham (1985).

The girth data shows no statistical significance between treatments. The probable reason for this is that in all the treatments the length of the cut remained same for the tree. It has been reported that the lengthening the cut is more deleterious for girth increment than a higher frequency for a given tapping method (De Jonge, 1969; Ng et al., 1969). Reducing the frequency of tapping at a constant length of the cut does not result in any appreciable difference in girthing at a constant length of the cut (Ng et al., 1965).

There is a possibility for exploiting RRII 105 more profitably on ½ S d/3 6d/7 than ½ S d/2 6 d/7 or 2 x ¼ S ↑↓d/2 6 d/7 (t,t), the cost of which has to be worked out under different situations.

ACKNOWLEDGEMENT

The authors thank Dr. M. R. Sethuraj, Director of Research, Rubber Research Institute of India for his valuable guidance in this study. Thanks are also due to Mr. K. Satheesan, F.A. (S.G), RRII for his able assistance in compiling the data.

REFERENCES

BEALING, F. J. and CHUA, S. E. 1972. Output, composition and metabolic activity of *Hevea* latex in relation to tapping intensity and the onset of brown bast. *J. Rubb. Res. Inst. Malaya.* **23**: 204–231.

CHUA, S. E. 1966. Physiological changes in *H. brasiliensis* tapping panels during the induction of dryness by interruption of phloem transport. 1. Changes in latex. *J. Rubb. Res. Inst. Malaya.* **19** (5): 282–285.

DE JONGE, P. 1969. Exploitation of *Hevea*. *J. Rubb. Res. Inst. Malaya.* **21** (3): 283–291.

GAN LIAN TIONG, CHEW OE KHENG, HO CHAI YEE and WOOD, B. J. 1985. Stimulation regimes for reduced tapping intensity on panels BO–1 and BO–2 of RRIM 600, GT 1 and PBIG/GG 1 seedlings. *Int. Rubb. Conf.* 1985. Proc. Kuala Lumpur. **III**: 338–367.

MILFORD, G. F. J., PAARDEKOOPER, E. C. and HOCHAI YEE. 1969. Latex vessel plugging, its importance to yield and clonal behaviour. *J. Rubb. Res. Inst. Malaya* **21** (3): 274–282.

NG, E.K., ABRAHAM, P. D., GILLS, D. S. and P'NG, T. C. 1965. Exploitation of young rubber. Preliminary results. *Plrs' Bull. Rubb. Res. Inst. Malaya.* No. **80**: 177–193.

NG, E. K., ABRAHAM, P. D., P'NG, T. C. and LEE, C. K. 1969. Exploitation of modern *Hevea* clones. *J. Rubb. Res. Inst. Malaya.* **21**(3): 292–329.

PAARDEKOOPER, E. C., LANGLOIS, S. J. C. and SOMPONG SOOKMARK. 1975. Influence of tapping intensity and stimulation on yield, girth and latex constitution. *Int. Rubb. Conf. Kuala Lumpur.* 290–314.

PARANJOTHY, K., GOMEZ, J. B. and YEANG, H. Y. 1975. Physiological aspects of brown bast development. *Int. Rubb. Conf.* Kuala Lumpur. **11**: 181–202.

P'NG, T. C. and LEE, C. K. 1970. Tapping systems for young rubber. *Plrs' Bull. Rubb. Res. Inst. Malaya.* No. **111**, 285

RANDS, J. P. 1921. Brown bast disease of plantation rubber, its cause and prevention. *Arch. Rubber cult.* Med-Indie **5**: 233.

SANDERSON, A. R. and SUTCLIFFE, M. 1921. Brown bast–An investigation into its cause and methods of treatment. *The Rubber Growers' Association*, London.

SHARPLES, A. and LAMBOURNE, J. 1924. Field experiments relating to brownbast disease of *Hevea brasiliensis*. *Malaya. Agric. J.*, **12**: 290.

SIVAKUMAR, S., ISMAIL HASHIM and ABRAHAM, P. D. 1985. The effect of direction and position of cut on yield responses to stimulation. *J. Rubb. Res. Inst. Malaysia.* **33** (2): 83–104.