EARLY PERFORMANCE OF A FEW INDIGENOUS AND EXOTIC CLONES OF *HEVEA BRASILIENSIS* IN A LARGE SCALE TRIAL

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ABSTRACT

A large scale trial, which is the second stage of clone evaluation, was laid out at Central Experiment Station of Rubber Research Institute of India during 1994. Twelve clones consisting of three exotic hybrid clones introduced from Malaysia in 1993 and three hybrid clones and four ortets developed by RRII were evaluated along with RRII 105 and RRIM 600 as controls. Among the 12 clones, the hybrid clone 86/44, recorded the maximum yield potential of 67.17 g/t/t in the BO - 1 panel over six years of tapping. The yield performance of introduced clone RRIM 712 (59.87g/t/t) and 86/120 (54.68g/t/t) were on par with that of RRII 105 (54.0 g/t/t). The highest summer yield was recorded by 86 / 120 (38.31 g/t/t) which was significantly superior to that of RRII 105 (29.64 g/t/t).

The clone 86 / 120 showed significantly better girth over both the controls with a mean girth of 60.93cm and maximum tappability of 88. 63 percent. 86/44 recorded 75 percent tappability as against 70 percent recorded for RRII 105. Seven clones recorded latex vessel rows better than that of RRII 105 of which 86/120 showed the highest number of 16.59. Incidence of wind damage and tapping panel dryness was comparatively low in the clone 86/44. 86/120 exhibited less incidence of pink. RRIM 712 was not affected by wind damage. The present investigation indicates possibilities of further yield gain in rubber.

Keywords: Large scale trial, introduced clones, clone evaluation

INTRODUCTION

The Rubber Research Institute of India initiated tree improvement programs in1954, for which the techniques adopted have been conventional breeding methods like ortet selection and hybridization. (Nair and Panikkar,1966, Nair and Jacob 1968; Nair and George, 1968; Nazeer *et al.*, 1986, Mydin *et al.*, 1994, Licy *et al.*, 2003, Mydin & Mercykutty, 2007). Modern clones evolved have attained a ten to fifteen fold increase in productivity over the yield recorded in the initial plantations with unselected seeds. RRII 105, with a commercial yield of over 2.2 tonnes/ha/yr, is one of the highest yielding clones ever evolved. Popular clones introduced from other countries, through bilateral / multilateral clone exchanges programmes, are also evaluated under local agro-climatic situations so that genetic gain achieved in different rubber research institutes could be utilized. (Varghese and Mydin, 2000; John *et al.*, 2009).

Clonal selection, includes preliminary evaluation for yield in small- scale trials, more elaborate large- scale trials and on- farm trials before a clone is released for cultivation. The present paper reports the yield performance in the B0-1 panel over six years of tapping and secondary characteristics of three introduced Malaysian clones along with newly evolved indigenous hybrid and ortet clones.

MATERIALS AND METHODS

A large scale trial, which is the second stage of clone evaluation, was laid out at Central Experiment Station (CES) of RRII during the year 1994. The study included 12 clones consisting of three exotic hybrid clones introduced from Malaysia in1993 and seven RRII clones of which three are hybrid clones and four ortets (Table 1) with RRII 105& RRIM

600 as control. The Randomized Block Design with three replications having 16 trees per plot was adopted. The trees were opened for tapping at the eighth year in 2003. Yield recording was done by cup coagulation method in normal tapping days once in a month. The tapping system adopted was S/2d3 6d/7. The trees were not given any tapping rest. Summer yield was assessed by computing the yield during the period from February to March (Bhaskaran Nair & Marattukalam, 1975). The trees were rainguarded during the rainy months. Thickness of the bark was measured using a bark guage at a height of 150 cm above the bud union when the trees were opened for tapping. Yield performance over BO - 1 panel, summer yield during the period, percentage of tappable trees, girth at opening, girth increment (GI) before and after tapping, thickness of virgin bark, and number of latex vessel rows were recorded and data were subjected to statistical analysis. Incidence of wind fastness in terms of uprooting, branch snap and trunk snap, pink disease and TPD was estimated by counting the affected trees. Morphological features of the test clones at mature stage have been elucidated

RESULTS AND DISCUSSIONS

Wide variation was exhibited by the clones in yield and yield components. Among the 12 clones, the hybrid clone 86/44, progeny of the cross PB 242 X RRII 105, recorded the maximum yield potential of 67.17 g/t/t in the BO - 1 panel over six years of tapping (Table 2). This clone registered a significant yield improvement of 24.38 % over the control clone RRII 105. 86/44 also exhibited high summer yield (33.21 g/t/t). In the earlier small scale trial also (Mydin *et al.*, 2004) 86/44 was ranked in the best group of selections producing 30 g dry rubber per tree per tapping in the first year of tapping. The yield performance of introduced clone RRIM 712 (59.87g/t/t) and 86/120 (54.68g/t/t) were on par with that of RRII 105 (54.0 g/t/t). Malaysian Rubber Board has reported a mean yield of 2137 kg/ ha/ yr for the first 11 years of tapping, and was 12% higher than the control RRIM 600 (Anonymous, 1974, 1998) The highest summer yield was recorded by 86/120 (38.31 g/t/t) which was significantly superior to that of RRII 105 (29.64 g/t/t).

There was significant clonal variation with respect to girth at opening. Girth of the trees at the time of opening and girth increment before and after tapping is the best indices for early tappability and general vigour. As shown in Fig 1, 86/120 showed significant superiority over both the controls with a mean girth of 60.93cm. Maximum tappability (88. 63 percent) was also recorded for this clone. 86/44 recorded 75 percent tappability as against 70 percent recorded for RRII 105. Mean girth increment during immaturity showed significant clonal variation. However, the rate of girth increment on tapping was comparable among the clones (Table 3).

Anatomical parameters are one of the major structural yield components in rubber. Virgin bark thickness ranged from 7.35mm (86/44) to 6.18 mm (O 65) and clonal variations were significant. Significant difference among the clones was observed in the case of latex vessel rows also. Seven clones recorded latex vessel rows better than that of RRII 105 of which 86/120 showed the highest number of 16.59. RRIM 728 and O 65 recorded the lowest number of latex vessel rows of 8.70 and 9.16 respectively (Table 4).

The highest yielding clone, 86/44 was not affected by any form of wind damage and there was no incidence of tapping panel dryness also (Tables 5 & 6). Pink disease intensity for this clone was 12.50 %, where as RRII 105 recorded 8.33 % intensity. The clone 86/120 exhibited comparatively no incidence of pink. The incidence of tapping panel dryness was the highest in this clone 86/120 (6.25 %).

A few high yielding clones *viz.*, 86/44, 86/ 120 and RRIM 712 could be identified from the present study. A superior clone is expected to exhibit high yield and other desirable secondary characters. The highest yielding clone 86/44 which combined high summer yield, better growth, high wind tolerance and comparatively no incidence of TPD is under further multilocational evaluation in RRS, Padiyoor in North Kerala, India and various large estates

in the traditional rubber growing region. The vigorous clone 86/120 recorded maximum tappability, highest summer yield, highest number of latex vessel rows, and less incidence of pink disease. RRIM 712 recorded no incidence of wind damage.

Elucidation of morphological characters of a clone assumes significance in the context of ensuring the authenticity of planting materials. The clones under study exhibited distinct morphological characters at the mature stage (Table 7).

The present investigation indicates possibilities of further yield gain in rubber. In view of the climate change, higher cost of inputs like labour, shortage of tappers and non-availability of land, evolving improved cultivars is the best method to increase natural rubber production.

CONCLUSIONS

Among the 12 clones, the hybrid clone 86/44, recorded the maximum yield potential in the BO - 1 panel over six years of tapping (67.17 g/t/t). The yield performance of introduced clone RRIM 712 and 86/120 were on par with that of RRII 105. The clone 86/120 showed significantly better girth over both the controls and maximum tappability of 88.63 percent. 86/44 recorded 75 percent tappability as against 70 percent recorded for RRII 105. Seven clones recorded latex vessel rows better than that of RRII 105 of which 86/120 recorded the highest number of 16.59. Incidence of wind damage and tapping panel dryness was comparatively low in the clone 86/44. The present investigation indicates possibilities of further yield gain in rubber.

Table 1 Details of the clones

Clone	Source	Parentage
RRIM 712	Hybrid clone introduced from Malaysia	RRIM 605 x RRIM 71
RRIM 722	Hybrid introduced from Malaysia	RRIM 600 x TK 4
RRIM 728	Hybrid introduced from Malaysia	GT 1 x RRIM 623
86/ 44	Hybrid Selection from 1986 HP programme	PB 242 x RRII 105
86/ 120	Hybrid Selection from 1986 HP programme	RRII 105 x RRII 118
55/180	Hybrid Selection from 1955 HP programme	Tjir1X Gl1
RRII 50	Ortet selection from irradiation of Tjir 1	Primary clone
RRII 51	Ortet selection from irradiation of Tjir 1	Primary clone
O 65	Ortet selection from genetic variant	Primary clone
O 70	Ortet selection from genetic variant	Primary clone
RRII 105	Check	Tjir 1 x Gl1
RRIM 600	Check	Tjir1 x PB 86

Table 2 Mean yield and summer yield (g/t/t)

Clone	Mean yield over 6 years	Mean summer yield
RRIM 712	59.87	29.29
RRIM 722	42.88	25.78
RRIM 728	37.85	21.99
86/ 44	67.17	33.21
86/ 120	54.68	38.31
86/180	28.35	15.67
RRII 50	35.24	18.44
RRII 51	32.40	19.50
O 65	27.58	18.75
O 70	23.33	15.14
RRII 105	53.99	29.64
RRIM 600	31.95	22.12
CD(P=0.05)	9.80	6.43

Table 3 Girth, tappability and GI before and on tapping

Clone	Girth at opening (cm)	Percent tappable trees	GI before tapping (cm/yr)	GI on tapping (cm)
RIM 712	51.50	76.00	9.10	2.56
RRIM 722	48.87	50.00	8.28	2.34
RRIM 728	49.65	56.82	8.51	2.54
86/ 44	56.70	74.42	9.25	2.13
86/ 120	60.93	88.63	9.78	3.56
55/180	55.76	72.72	9.15	2.26
RRII 50	52.24	63.41	8.90	2.90
RRII 51	53.70	60.00	9.19	3.05
O 65	59.13	85.36	11.25	3.15
O 70	53.20	75.61	8.16	2.93
RRII 105	53.13	70.00	8.98	2.89
RRIM 600	45.50	46.51	7.98	2.86
CD(P=0.05)	7.60	-	1.56	N.S

Table 4 Bark anatomical parameters

Clone	Bark thickness (mm)	No. of latex vessel rows
RRIM 712	6.73	12.96
RRIM 722	6.43	11.40
RRIM 728	6.63	8.70
86/44	7.35	12.60
86/ 120	6.82	16.59
55/180	7.22	10.26
RRII 50	6.64	12.63
RRII 51	7.28	12.43
O 65	6.18	9.16
O 70	6.78	12.53
RRII 105	6.38	12.26
RRIM 600	6.59	13.69
CD (P= 0.05)	0.94	2.98

Table 5 Percent incidence of wind damage

Clone	Uprooting	Branch snap	Trunk snap
RRIM 712	-	-	-
RRIM 722	-	4.22	-
RRIM 728	2.08	6.33	-
86/ 44	-	-	-
86/120	4.16	4.22	4.16
55/180	-	2.11	2.08
RRII 50	2.08	-	4.16
RRII 51	6.33	-	2.08
O 65	2.08	4.16	-
O 70	-	2.08	-
RRII 105	-	6.25	4.16
RRIM 600	-	4.16	-

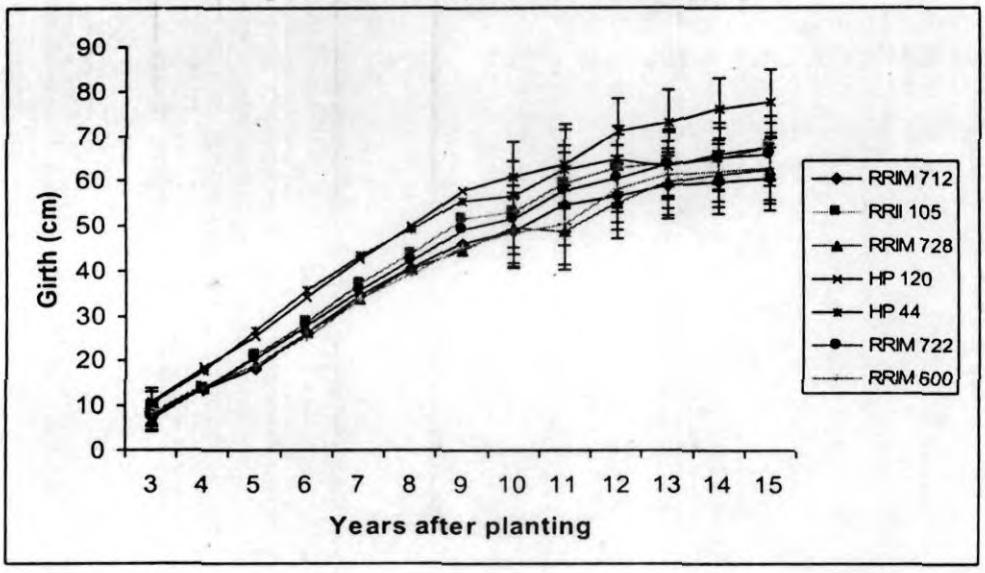
Table 6 Incidence of pink and Tapping panel Dryness (TPD)

Clone	Incidence of pink disease (%)	Incidence of TPD (%)
RRIM 712	8.33	2.08
RRIM 722	4.16	-
RRIM 728	4.16	-
86/ 44	12.5	-
86/120	-	6.25
55/180	12.5	2.08
RRII 50	4.16	-
RRII 51	6.25	-
O 65	10.41	4.16
O 70	4.16	2.08
RRII 105	8.33	4.16
RRIM 600	2.08	2.08

Table 7 Morphological characters of the clones

RRIM 712	Straight and tall trunk; heavy, wide angled, long and slightly leaning branches; canopy above average.
RRIM 722	Trunk is slightly leaning; heavy and light branches with light canopy.
RRIM 728	Straight and tall trunk ; low but heavy branches; narrow but dense canopy.
86/44	Straight, tall and cylindrical trunk; high heavy branching; canopy restricted to the top, open and narrow; short secondary branches.
86/120	Straight and tall; vigorous; low heavy branches; thick and closed canopy.
55/180	Slightly leaning and cylindrical trunk; low but light and long branches; canopy almost on the top.
RRII 50	Straight trunk; low branching; branches are moderately heavy; pale green canopy.
RRII 51	Slightly leaning; unbalanced and low branching, light and pale green canopy.
O 65	Straight, tall and cylindrical trunk; vigorous, long and heavy acute angled branches.
O 70	Slightly leaning; moderately heavy branches; long acute primary branches; open canopy but each whirl is closed
RRII 105	Straight and tall; 3-4 heavy branches; union strong; branch lets many; canopy restricted to top, dark green canopy.
RRIM 600	Low branching; 3-4 heavy branches; fork narrow and union strong; dense and spreading canopy; yellowish green canopy

Figure 1 Girth increment before and on tapping



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