

**PERFORMANCE OF RRII SELECTIONS FROM 1956 BREEDING PROGRAMME
IN THE LARGE SCALE TRIAL**

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Abstract

Crop improvement by breeding and selection, initiated by the Rubber Research Institute of India in 1954, gave emphasis to evolve planting materials of high production potential during the first phase of the programme. From the hand pollinated progenies of the 1956 breeding programme, nine clones (RRII 201, RRII 202, RRII 203, RRII 204, RRII 205, RRII 206, RRII 207, RRII 208 and RRII 209) were selected based on yield and other secondary characteristics. The early performance of these clones in the large scale trial is presented in this paper.

The trial was laid out at the Central Experiment Station, Chethackal during 1973 in a randomized block design with three replications. Vigour during immaturity period and after tapping, yield and secondary characters were recorded.

Significant differences in yield and growth attributes were noted among clones. During the 6th year after planting RRII 203 attained tappable girth. Yield data for the first six years of tapping have shown that there were significant differences among the clones compared to the control. RRII 208 and RRII 203 were found to be promising with an average yield of 57.12 and 55.14 g tree⁻¹ tap⁻¹, respectively. Wide differences were also observed with regard to secondary attributes. Clonal variation in the case of latex, rubber and vulcanizate properties was also observed.

Introduction

Crop improvement programme by breeding and selection was

initiated by the Rubber Research Institute of India in 1954. The Institute is making regular attempts to develop new clones of Hevea by hybridization followed by selection (Nair and Panikkar, 1966; Nair et al., 1975). Emphasis was given to evolve planting materials of high production potential during the first phase of the programme. As a result a set of clones of 100 series (Nair and George, 1968), 200 series (Saraswathy Amma et al., 1980) and 300 series (Premakumari et al., 1982) were evolved and the selected clones are under various stages of experimentation. This paper presents the performance of nine selections, of 1956 breeding programme, in the large scale trial.

Materials and Methods

Budgrafted plants of the nine RRII selections (RRII 201, RRII 202, RRII 203, RRII 204, RRII 205, RRII 206, RRII 207, RRII 208 and RRII 209) and the control (PR 107) were planted at Central Experimental Station (Chethackal) of the Rubber Research Institute of India during 1973 in a randomised block design with three replications. The gross stand per plot was 36. Observations were taken from the 16 plants in the centre of each plot. Uniform cultural operations were carried out. During immature stage annual girth and secondary characters were recorded. The trees were opened during 1981 and the tapping system followed was 1/2S d/2. Yield was recorded by cup coagulation method. Annual yield per tree per tap and yield during summer were computed. Yield depression during summer was calculated from the yield during the period February to May as the percentage of the average annual yield. Important secondary characters like vigour, growth habit, thickness of virgin and renewed bark, susceptibility to diseases and wind damage were recorded. Growth vigour was recorded by measuring the girth of the trunk at a height of 150 cm above the bud union. Thickness of bark was measured with a Schleipers' gauge. The data were subjected to statistical analysis. Latex properties like magnesium content, mooney viscosity and plasticity retention index were recorded. Rubber samples were also compounded according to ACSI formulation and tensile strength was determined.

Results and Discussion

Growth vigour during the immaturity period is given in Table 1.

Table 1. Mean girth (cm) of RRII 200 series selections.

Clone	Parentage	1977	1978	1979	1980	1981
RRII 201	Tjir 1 x PB 25	27.88	37.71	48.18	57.31	64.47
RRII 202	PB 86 x Mil 3/2	29.39	39.98	49.37	58.13	66.71
RRII 203	PB 86 x Mil 3/2	30.37	44.15	53.45	59.76	67.38
RRII 204	PB 86 x Mil 3/2	22.25	33.92	44.51	54.56	62.51
RRII 205	PB 86 x BD 10	23.19	35.62	45.34	51.39	58.27
RRII 206	Mil 3/2 x AVROS 255	24.24	36.77	45.92	51.33	59.36
RRII 207	Mil 3/2 x AVROS 255	24.75	38.72	50.39	58.50	69.78
RRII 208	Mil 3/2 x AVROS 255	21.71	33.45	43.72	50.14	58.06
RRII 209	Mil 3/2 x BD 10	24.08	37.01	48.80	55.93	64.60
PR 107	Primary clone	24.16	36.49	46.05	51.81	57.79
GM		25.20	37.38	47.58	54.89	62.89
SE		2.74	3.03	2.91	2.90	2.57
CD		8.14	9.00	8.64	8.61	7.64

Significant difference in vigour was noted for the clone RRII 203. This clone attained tappable girth at the 6th year after planting. RRII 207 also attained tappable girth by this time. Among the selections RRII 203 and RRII 207 are the most vigorous clones.

Mean annual yield of the selections and control for the first six years of tapping is given in Table 2. Compared to the control PR 107 significant difference in yield was noted among the clones. During the sixth year of tapping RRII 208 topped the list (86.77 g tree⁻¹ tap⁻¹) followed by RRII 202 (84.48 g) and RRII 203 (79.86 g). Mean yield over six years of tapping, percentage of yield depression during drought, girth increment on tapping, thickness of virgin and renewed bark are given in Table 3. RRII 208 and RRII 203 showed

Table 2. Mean yield ($\text{g tree}^{-1} \text{ tap}^{-1}$) of RRII 200 series selections.

Clone	1981	1982	1983	1984	1985	1986
RRII 201	29.61	35.90	43.75	68.59	67.77	71.70
RRII 202	25.41	36.31	47.71	68.43	67.83	84.48
RRII 203	29.73	39.09	48.57	67.30	66.27	79.86
RRII 204	28.86	36.32	41.89	64.42	64.59	78.17
RRII 205	24.62	32.62	39.28	43.96	47.45	56.13
RRII 206	23.61	32.48	49.51	76.16	72.57	72.02
RRII 207	21.76	32.34	42.15	62.57	55.35	55.91
RRII 208	35.19	38.91	46.73	66.37	68.76	86.77
RRII 209	28.18	38.56	46.71	68.43	58.25	70.26
PR 107	17.52	21.77	30.37	50.11	46.06	46.51
GM	26.45	34.43	43.67	63.63	61.49	70.18
SE	2.18	2.69	2.94	4.25	4.79	5.06
CD	6.47	7.99	8.73	12.62	14.23	15.03

Table 3. Yield and secondary characters of the selections.

Clone	Girth in- crement on tapping 5 years average	Yield (%) depression during summer period	Thickness of virgin bark	Thickness of renewed bark	Mean yield g $\text{tree}^{-1} \text{ tap}^{-1}$ over 6 years
RRII 201	4.56	40	9.46	8.08	52.89
RRII 202	4.05	41	9.62	8.60	55.03
RRII 203	3.67	40	9.15	8.03	55.14
RRII 204	4.30	41	9.54	8.16	52.38
RRII 205	4.28	34	10.38	8.43	40.68
RRII 206	5.00	35	9.52	8.48	54.39
RRII 207	5.12	29	9.34	9.17	45.01
RRII 208	4.22	40	9.74	8.61	57.12
RRII 209	4.77	33	9.31	8.01	51.73
PR 107	3.88	43	9.82	8.91	35.39

the highest yield giving 57.12 g and 55.14 g respectively. The least yield depression during summer was recorded in RRII 207 followed by RRII 209, RRII 205 and RRII 206. The control clone PR 107 showed the highest percentage of yield depression. There was no significant differences among the clones with regard to the thickness of virgin and renewed bark.

Secondary characters of the clones are given in Table 4. RRII 203 showed moderately heavy and well distributed branches and moderately dense canopy. RRII 208 showed well distributed branches having light and open canopy. RRII 209 showed high incidence of wind damage. The incidence of wind damage was below average for the clone RRII 208 and no wind damage incidence was observed for PR 107. The resistance of PR 107 to wind was reported earlier (Joseph *et al.*, 1980). Brown bast incidence was average for the clones and absent in RRII 206, RRII 207 and PR 107. RRII 203 showed average tolerance to common diseases whereas the young plants of RRII 208 were susceptible to Phytophthora.

Properties of latex, raw rubber and vulcanizate of different clones are shown in Table 5. Magnesium (Mg) content in the latex is an undesirable character affecting the colloidal stability. RRII 205 and RRII 207 showed least Mg content (0.009%) followed by RRII 208, PR 107, RRII 202 and RRII 203. RRII 204 showed the highest Mg content (0.024%). Variation in mooney viscosity is not pronounced and the minimum value obtained is (61) for RRII 205 and the maximum value (74) for RRII 209. There is not much clonal variation with regard to plasticity retention index. Clonal variation is noted for tensile strength and the minimum tensile strength was noted for clone RRII 201 (14.40) and the maximum by RRII 207 (16.50) (Table 5).

The results presented above indicate that there was significant differences in vigour and yield among the clones. The high vigour of RRII 203 was already reported (Saraswathy Amma *et al.*, 1988). Compared to the control PR 107 all the RRII clones showed better yield. Clonal variation was also observed with regard to other secondary characters like properties of raw rubber and vulcanizates. RRII 208

Table 4. Secondary characters of the clones.

Clone	Habit	Disease tolerance	
		Oidium	Phytophthora
RRII 201	Slightly leaning and fluted stem, heavy spreading branches, canopy average, foliage shade tolerant. Virgin bark smooth with distinct leaf scar.	Average	Average
RRII 202	Slightly fluted stem with heavy branches, self shedding canopy high set and above average. Smooth virgin bark with normal leaf scar. Renewed bark smooth.	Average	Average
RRII 203	Straight tall stem, major branches moderately heavy, well distributed, shade tolerance good. Canopy open and moderately heavy. Virgin bark and renewed bark smooth.	Above average	Above average
RRII 204	Straight cylindrical stem with very heavy branches. Canopy average, self shedding, smooth virgin bark with slightly prominent leaf scar. Renewed bark slightly rough.	Below average	Average
RRII 205	Straight stem with moderate sized branches, shade tolerant. Rough virgin bark with cracks and indistinct leaf scar. Slightly rough renewed bark.	Below average	Below average
RRII 206	Straight and tall stem. Heavy main branches with light secondaries. Moderately dense canopy with average foliage. Shade tolerant, virgin and renewed bark smooth.	Average	Average
RRII 207	Upright and slightly fluted stem with moderate sized branches. Canopy average. Virgin and renewed bark smooth.	Average	Average
RRII 208	Straight stem, branches average and well distributed, canopy light and open. Virgin bark and renewed bark smooth. Distinct leaf scar.	Average	Susceptible during young stage
RRII 209	Straight and tall stem, main leader prominent with heavy branches, canopy above average, virgin and renewed bark smooth.	Average	Average
PR 107	Tall and sturdy trees with erect stem. Strong heavy primary branches with light secondaries. Crown, narrow and well balanced. Self pruning, leaf scar prominent. Virgin and renewed bark smooth.	Average	Highly susceptible

Table 5. Properties of raw rubber and vulcanizate of different clones.

Clone	Magnesium (% on TS)	Mooney viscosity ML (1+4) at 100°C	Plasticity retention index	Tensile strength (N/mm ²)
RRII 201	0.020	70	85	14.4
RRII 202	0.015	71	84	14.9
RRII 203	0.015	69	91	16.2
RRII 204	0.024	67	90	16.1
RRII 205	0.009	61	90	15.0
RRII 206	0.016	68	89	16.0
RRII 207	0.009	71	86	16.5
RRII 208	0.011	73	86	15.3
RRII 209	0.017	74	87	15.6
PR 107	0.014	67	87	15.1

and RRII 203 showed average Mg content and medium mooney viscosity. RRII 203 recorded high plasticity retention index and above average tensile strength.

Among the clones studied RRII 203 and RRII 208 are the promising high yielders from the progenies of 1956 breeding programme. RRII 203 is noted for its high vigour. Even though the coagulum of this clone has a tendency for black discoloration, rubber properties are not affected.

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