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AN ATTEMPT TO IMPROVE TEST TAPPING IN *HEVEA* SEEDLINGS

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ABSTRACT

Studies on a population of *Hevea* seedlings revealed a close correlation of test tapping yield with the yield of the first year regular tapping and a drop in correlation value with the subsequent yield. The mean yield of three rounds of test tapping was more reliable than that of one round alone. Analysis of the data on yield and girth with a view to looking in to the possibility of further improvements in the early evaluation methods, revealed a fair degree of highly significant positive correlation of the girth at test tapping with the mean yield of test tapping (r=0.4630, p<0.010). Its influence on the first year yield of regular tapping was low (r=0.1869, p<0.05) and the correlation with the mean yield over five years of tapping was not significant. Similar trend was noted in the relationship of the girth at opening with the first year yield of regular tapping (r=0.2248, p<0.01) and with the mean yield over five years of tapping (r=0.1832, p<0.05) although there was high correlations among the girth at different stages. On the contrary the girth increment on tapping was highly correlated with the yield increment on tapping (r=0.7023, p<0.01). This indicated that girth increment govern the yield more than the actual girth. Hence, for further improvement in early evaluation methods potential of the tree for high rate of girth increment on tapping should also be identified at the early growth phase.

INTRODUCTION

Hevea brasiliensis Muell Arg being a perennial tree, improvement through breeding and selection is very time consuming. The tree takes about seven years to attain tappable girth and long duration of observation is required further for reliable selection. The two important mehods of early evaluation tried earlier were the incision method of grading nursery plants developed by Cramer (1968) and the test tapping method suggested by Hamakar (1914) and modified by Vollema (1934) and Dijkman (1939). Test tapping experiments based on the Hamaker method showed correlations between the test tapping yield with that of the first year of normal tapping only. A drop in correlation was observed during later years (Dijkman, 1941; Morris and Mann, 1931-1938).

In the present study an attempt was made to improve the method of test tapping by taking into consideration girth and yield at different growth phases of the tree.

MATERIALS AND METHODS

A population comprising of 286 seedlings involving 22 crosses, resultant of 1970 breeding programme, were planted in a newly cleared forest area at the Central Experiment Station of the Rubber Research Institute of India at Chethackal in 1972. The spacing was 5 m × 5 m and conventional cultural operations were carried out.

At the fourth year, the trees which had attained a girth of 15 centimetres or above, at a height of 125 cm, were test tapped for which Hamaker-Morris-Mann method was followed with slight modifications. The trees were opened for test tapping at a height of 50 cm from the ground level, on a half spiral cut with a slope of 25 to the horizontal plane. Daily tapping was carried out for ten days. The crop of the last five days of test tapping was collected by cup coagulation method and the cuplumps were dried and weighed. The first round of test tapping (Test tapping 1) was done in May 1976. The test tapping was repeated in October 1976 and January 1977 (Test tapping 2 and Test tapping 3 respectively). The mean yield of three test tappings was calculated (referred to as the mean yield of test tapping).

The trees were opened for regular tapping in 1979 March, at the age of seven years and the S/2 d/2 system was followed. Yield recording was carried out by cup coagulation method. Annual mean yield/tree/tap(g) was assessed from monthly yield recordings. Annual recordings of girth at a height of 125 cm were made from the year of opening.

The yield increment over five years of tapping was calculated as percentage of the yield on first year tapping and the girth increment over five years of tapping was calculated as percentage of girth at opening.

The data were statistically analysed for the correlations of the yield on test tappings, their mean, the girth at test tapping and the girth at regular opening with the yield of first year regular tapping and the mean yield over five years of regular tapping. Correlations of the girth at test tapping with the mean yield of test tapping, girth at regular opening and the girth at the fifth year of tapping as well as the girth at opening with the girth at the fifth year of tapping were also studied. Along with this, the correlation between the percentage yield increase over five years of regular tapping with the percentage girth increment over five years after regular opening was examined.

RESULTS AND DISCUSSIONS

Correlations of the yield of each round of test tapping, mean yield of the test tappings, girth at test tapping and the girth at regular opening with the yield of first year regular tapping and with the mean yield over five years of regular tapping are given in Table 1. The test tapping yields and their mean showed highly significant positive correlations with the yield of first year regular tapping with fair degrees of correlation coefficients. There was considerable drop in the correlation coefficients when these characters were correlated with the mean yield over five years of regular tapping although the correlations were significant. This result was in agreement with earlier studies (Dijkman, 1941 and Morris and Mann, 1931-38).

The data in Table I indicated that the correlation of yield on test tapping 1 with mature yield was not so close as in the case of that on test tappings 2, 3 and their mean. It may be mentioned that test

Table I. *Correlations among the girth and yield factors at immature and mature phases*

Character Yield	Yield				Girth		
	Test Tapping 1	Test Tapping 2	Test Tapping 3	Mean	at test tapping	at regular opening	Girth increment on tapping
First year regular tapping	0.4313**	0.5287**	0.5343**	0.5456**	0.1869*	0.2248**	
Mean over five years of regular tapping	0.2037**	0.2702**	0.3309**	0.2931**	0.0800	0.1832*	
Mean of test tappings					0.4630**		
Yield increment on tapping							0.7023**

** = $P < 0.01$
* = $P < 0.05$

tapping 1 was done during May which is part of the summer season. The seasonal yield variation in *Hevea* and an yield drop during summer season is well known (George, *et al.*, 1980; Premakumari, Sherief and Sethuraj, 1980 and Young and Paramjyothy, 1982.). However this result signified that the mean yield of different test tappings, covering different seasons, is more reliable for screening young rubber trees than the yield of a single test tapping.

The girth at test tapping had significant correlations with the mean yield of test tapping. But the correlation coefficients showed considerable drop when it was correlated with the first year yield and the relationship was not significant when it was correlated with the mean yield over five years of tapping. Correlations among the girth at test tapping, at opening and at the fifth year of tapping are given in Table II. The girth at test tapping showed high correlations with the girth at opening and the girth at the fifth year of tapping. The girth at opening was also highly correlated with the girth at fifth year of tapping.

The girth, at which regular tapping was commenced on the trees, was significantly correlated with the yield during the first year as well as the mean yield over five years of tapping. The correlation however was more pronounced with the first year yield (r=0.2248), but showed a decline with the mean yield over five years of tapping (r=0.1832). At the same time the percentage yield increase over five years of tapping was highly correlated with the percentage girth increase over five years after tapping (r=0.7023, P<0.01). The importance of girth

Table II. *Correlations among the girth characters*

Character	Girth at regular opening	Girth at 5th year of tapping
Girth at test tapping	** 0.7939	** 0.6097
Girth at regular opening		** 0.8683

** = P < 0.01

increment of tapping on the yield of *Hevea* clones had already been suggested (Sethuraj, 1981).

In this context, the high drop of correlation coefficients when the test tapping yields were correlated with the mean yield over five years of regular tapping is recalled. This drop in the degree of relationship between the test tapping yield and mature yield after a few years of tapping can be attributed to the high influence of girth increment on tapping on the yield increase on tapping. This result also implicated that a more reliable early prediction for yield in *Hevea* is possible only if the girth increment on tapping can also be predicted during the immature phase of the genotypes for which further work is needed.

The familywise yield and girth at test tapping as well as at regular tapping are shown in Table III. Substantial differences in yield as well as girth among the families were evident from the table. It was also noticed that the families involving RRII 6 as one of the parents gave comparatively high yield in test tapping as well as at regular tapping.

Table III. *Familywise yield and girth of the progenies of 1970 hand pollinations*

Sl.	Families	Mean yield of test tapping	Yield on regular tapping g/tree/tap ± SE		Girth cms ± SE	
		(g/tree) ± SE	1st year	Mean over five years	At test tapping	At regular opening
1.	RRII 6 × RRII 105	18.89 ± 8.5	52.07 ± 4.51	50.10 ± 7.31	21.67 ± 7.14	62.00 ± 6.21
2.	RRII 6 × IAN 45.X13	23.42 ± 5.02	23.01 ± 0.73	26.51 ± 2.31	23.00 ± 2.09	57.00 ± 3.03
3.	RRII 6 × FX 516	30.44 ± 12.95	41.85 ± 6.75	35.20 ± 2.72	29.00 ± 2.55	66.33 ± 3.33
4.	RRII 102 × RRII 6	41.33 ± 12.20	51.17 ± 20.07	38.88 ± 14.58	26.33 ± 1.75	58.00 ± 3.06
5.	FX 516 × RRII 6	22.85 ± 4.35	24.50 ± 2.73	30.22 ± 2.75	26.23 ± 1.23	57.00 ± 1.74
6.	FX 516 × PB 5/60	11.04 ± 2.58	14.75 ± 2.71	18.94 ± 1.70	20.63 ± 1.78	50.63 ± 1.55
7.	FX 516 × AV 255	7.22 ± 1.69	25.44 ± 3.64	34.63 ± 7.76	19.83 ± 1.26	48.94 ± 2.35
8.	FX 516 × GL 1	15.04 ± 1.83	25.82 ± 1.74	32.86 ± 1.96	21.54 ± 0.60	52.16 ± 0.92
9.	RRII 102 × PB 86	23.82 ± 4.4	29.51 ± 4.38	32.14 ± 3.78	23.61 ± 1.34	53.11 ± 1.99
10.	RRII 102 × RRII 19	15.67 ± 8.17	15.69 ± 2.02	31.49 ± 4.81	22.83 ± 1.09	57.57 ± 5.57
11.	PB 86 × RRII 33	13.16 ± 2.30	17.14 ± 2.15	19.63 ± 1.67	26.27 ± 1.56	60.20 ± 1.86
12.	PB 86 × FX 516	12.91 ± 1.99	17.21 ± 3.80	18.99 ± 3.62	24.43 ± 1.21	53.64 ± 2.84
13.	PB 86 × F 4542	10.34 ± 4.67	13.81 ± 4.8	17.65 ± 3.68	26.75 ± 2.95	62.25 ± 4.75
14.	RRII 1 × RRII 33	13.9 ± 3.46	23.31 ± 4.12	26.38 ± 4.90	24.00 ± 1.03	61.50 ± 1.17
15.	RRII 106 × RRII 33	15.13 ± 3.17	17.80 ± 1.07	23.21 ± 2.24	27.20 ± 0.75	61.40 ± 0.91
16.	RRIM 526 × RRII 33	10.22 ± 0.95	17.69 ± 1.22	22.73 ± 6.95	25.00 ± 1.80	57.00 ± 2.65
17.	RRII 12 × RRIM 501	19.38 ± 1.88	29.67 ± 4.82	32.30 ± 3.72	24.86 ± 2.22	56.57 ± 2.80

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