

DEVELOPMENTS IN *HEVEA* PLANTING MATERIAL IN CEYLON

BY

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INTRODUCTION

Although the history of the Ceylon rubber industry dates back to the year 1876, no serious attempts had been made to improve yields in commercial plantations until budgrafting of *Hevea*, first carried out by Van Helten (1918) and confirmed in Ceylon at the Royal Botanic Gardens, Peradeniya, in 1920, paved the way for vegetative propagation of high-yielding seedlings.

Early selection among illegitimate seedling trees in commercial estates carried out by Taylor and Murray of the Rubber Research Scheme (Ceylon) during the period 1926—1935 resulted in three clones, Mil 3/2, Hillcroft 28 and Wagga 6278 (De Silva, 1953). These were capable of yielding over 1,000 lb dry rubber per acre per year and were used in replanting old seedling rubber, which during the post-war period were yielding between 300 to 400 lb dry rubber an acre. These clones represent the maximum development in yield that was possible by selection among old seedling rubber in Ceylon. Imports of seeds were therefore made from the Prang Besar and Tjikadoe seed gardens in the Far East. Selections from these resulted in three clones (De Silva, 1961), RRIC 5, 7 and Nab 15 with a yield potential of around 1,500 lb dry rubber per acre, per year. These clones are now being planted on a small scale commercially.

The next important development was the introduction of hand pollination techniques into the Institute's breeding programmes by Ford in 1939 (Murray, 1940). During the period 1939—1945, over 65,000 hand crosses were made between selected clone parents and the better selections were established as clones of the RRIC series. Owing to the high degree of disease susceptibility of clones developed earlier, emphasis at this stage was placed on yield as well as other desirable characters such as growth vigour, bark quality, latex properties and resistance to diseases and wind damage. Among the early selections in this programme, RRIC 45 emerged as a clone that offers the best combination of yield, disease resistance, good vegetative characters and suitability for planting in all districts in Ceylon. Another clone, RRIC 36, has given outstanding yields in all experimental plantings. These two clones are now available for commercial plantings in Ceylon. More recent selections, which have good secondary characters and are expected to yield over 2,000 lb dry rubber per acre are RRIC 13, 48, 50, 89, 100 and 101.

SELECTED CLONES

Exchange clones

An important step towards co-operation between the rubber research organizations in the Asian region was taken in 1952 at a meeting of the directors of the rubber research institutes held in Bogor. A result of this meeting was the final exchange of 20 of the best clones drawn from each territory and Ceylon's share of the benefit was the importation of material of the RRIM 500 and 600 series, TR, IRCI, PR, GT and AVROS clones from the Far East. These clones have now passed the preliminary testing stages for yield and disease resistance under our local conditions and the clones AVROS 1734, PR 252, IRCI 2 and 9 have now been selected for planting in small acreages in Ceylon.

Performance of clones

All clones resulting from the Institute's breeding programmes are first screened for yields and good secondary characters in preliminary small scale trials before they are recommended for experimental planting in commercial estates. The question of final selection for planting in larger acreages would depend at this stage, on the results of the Institute's large scale trials as well as the data collected from small scale commercial plantings. I do not wish to discuss at length all clones that are recommended for planting in Ceylon, but shall confine myself to a few selections which would be of interest in future replanting work.

Local clones

RRIC 45

Among local clones, RRIC 45 was one of the first clones of the RRIC series to be recommended for large scale planting in Ceylon. Observation plots of clone RRIC 45 planted at elevations of over 1,500 ft have shown good growth and freedom from *Oidium* leaf disease, so that by the use of this clone, as well as more recent *Oidium*-resistant selections, it should be possible in the future to rehabilitate most of the abandoned rubber at the higher elevations (Fig. 1). The yields of RRIC 45 can be slightly below that of clone PB 86 during the first two years of tapping, but generally exceed that of PB 86 from about the third year (for yields see Table 1).

RRIC 36

The clone RRIC 36 is derived from a cross between clones PB 86 and PR 107 and has inherited from both parents its susceptibility to Bark Rot under wet conditions. However, all available records indicate that it could be successfully grown in districts with an average rainfall of around 100 in. a year. In commercial plantations, the yields have exceeded 1,000 lb dry rubber per acre in the third year of tapping and have reached yields of over 1,700 lb in the sixth year of tapping (Fig. 2).

RRIC 89

The original 25-tree plot of clone RRIC 89 has been yielding an average of 20 lb dry rubber per tree per year, which represents a potential yield of over 2,000 lb an acre per year. In a second large scale trial, the clone RRIC 89 has been yielding an average of 28% more dry rubber per tree per year than clone PB 86 during the first two years in tapping (Fig. 3).

RRIC 13 and 50

The two clones RRIC 13 and 50 represent the best selections among twelve RRIC clones planted in a large scale trial in the wet districts. Each clone covers an extent of approximately four acres and have yielded up to 17 lb dry rubber per tree per year. This represents a potential yield of well over 2,000 lb dry rubber per acre, under tapping conditions in the wet districts (Fig. 4).

RRIC 48

Clone RRIC 48 represents the best selection among 29 clones, planted in a large scale trial, a majority of which are foreign clones introduced into Ceylon from Malaysia, Indonesia and Vietnam in the 1952 clone exchange. The clone RRIC 48 has been yielding consistently better than clone PB 86 during the first six years in tapping (Fig. 5).



Fig. 1. RRIC 45



Fig. 2. RRIC 36



Fig. 3. RRIC 89



Fig. 4. RRIC 50

TABLE I
LOCAL CLONES
YIELD IN LB DRY RUBBER PER TREE PER YEAR (140 TAPPINGS)

Clone	Year first tapped	Plot size (trees)	Year of tapping									
			1	2	3	4	5	6	7	8	9	
RRIC 13	1962	750	9.1	9.9	10.4	13.7	14.5	16.2	17.7	14.7		
RRIC 36	1961	800	9.2	10.2	12.7	12.9	11.7	12.9	16.3	13.8	14.0	
RRIC 36 PB 86	1965 1965	300 (300 × 4)=1200	7.4 5.4	8.6 7.1	8.5 7.1	9.1 7.0	9.4 7.1					
RRIC 45 PB 86	1965 1965	300 (300 × 4)=1200	5.3 5.4	6.8 7.1	8.7 7.0	8.7 7.1	7.6 7.1					
RRIC 48 PB 86	1964 1964	300 300	8.0 6.4	8.8 7.1	12.2 8.7	12.8 9.1	10.8 8.0	11.4 8.3				
RRIC 50	1962	750	5.2	6.9	11.5	12.1		17.9				
RRIC 89 PB 86	1968 1968	650 650	8.0 6.5	10.5 7.8								
RRIC 100 RRIC 100 PB 86	1965 1965 1965	10 5 (10 × 50)=500	7.0* 8.2* 7.8*	13.7* 15.5* 9.0*	28.1 26.9 10.5	19.7 20.8 8.3						
RRIC 101 PB 86	1965 1965	10 (10 × 50)=500	13.2* 5.3*	15.7* 6.2*	14.8 10.5	17.4 8.3						

* Tapped S/2, d/3, 67%.

TABLE 2

FOREIGN CLONES

YIELD IN LB DRY RUBBER PER TREE PER YEAR (140 TAPPINGS)

Clone	Year first tapped	Plot size (trees)	Year of tapping					
			1	2	3	4	5	6
AVROS 1734	1964	300	11.0	12.5	12.3	11.3	14.4	16.4
PB 86	1964	300	7.4	7.3	9.0	10.4	9.9	8.7
IRCI 2	1964	300	6.5	8.4	8.3	12.4	12.6	14.8
PB 86	1964	300	5.4	5.3	5.1	7.1	8.0	8.4
IRCI 2	1965	300	5.9	6.7	8.1	8.6	7.4	
PB 86	1965	(300 × 4) = 1200	5.4	7.1	7.1	7.0	7.1	
IRCI 9	1964	300	7.3	9.8	12.0	11.3	12.0	10.4
PB 86	1964	300	6.4	7.1	8.7	9.1	8.0	8.3
PR 252	1964	300	7.6	10.9	10.2	10.6	10.0	8.6
PB 86	1964	300	6.4	7.1	8.7	9.1	8.0	8.3



Fig. 5. RRIC 48



Fig. 6. RRIC 100



Fig. 7. RRIC 101



Fig. 8. AVROS 1734



Fig. 9. IRCI 2



Fig. 10. IRCI 7



Fig. 11. IRCI 9



Fig. 12. PR 252

RRIC 100 and 101

The clones RRIC 100 and 101 are two more recent additions to the RRIC series. These represent the two best yielders among 28 selections derived from the recent breeding programmes carried out by the Genetics & Plant Breeding Department (Fernando, 1969). Both clones, in small scale trials, have yielded about twice as much as PB 86 and are now available for experimental planting in estates. They have shown a high degree of adaptability to tapping at reduced frequencies, so that it should be possible to reduce tapping costs by tapping them at 67% intensity and still achieve yields approaching 3,000 lb dry rubber an acre (Figs. 6 and 7).

Foreign clones

All foreign clones imported into Ceylon during the 1952 clone exchange have been planted in large scale trials in the years 1952 and 1957. They have been in tapping for about six years and the following clones show promise of high yields and a fair degree of disease resistance (for yields see Table 2).

AVROS 1734

Among all foreign clones tested so far, AVROS 1734 has been the best yielder with a high degree of resistance to leaf and panel diseases, under planting conditions in Ceylon. The commercial yields recorded in the original experimental plot of 300 trees have exceeded 2,000 lb an acre in the fifth year of tapping (Fig. 8).

IRCI 2, 7 and 9

Among the IRCI clones the three clones IRCI 2, 7 and 9 have been the better yielders in Ceylon. A common feature among a majority of the IRCI clones has been a tendency to develop *Phytophthora* infections above the tapping panel, either on the main stem or at points of branching. In IRCI 2, 7 and 9, this type of infection has so far been limited to a small percentage of trees and they have recovered after treatment with fungicides. The yields of IRCI 2 and 9 in large scale trials have been consistently better than clone PB 86 (Figs. 9, 10 and 11).

PR 252

Among PR clones imported from Indonesia, the clone PR 252 has so far been the better yielder with relative freedom from diseases. All other PR clones introduced into Ceylon have been highly susceptible to *Oidium* leaf disease (Fig. 12).

CONCLUSION

A major obstacle to any rapid improvements in yield of *Hevea* has been the long period of testing any new material has to undergo before final selection. Although much effort has been made to discover an early index to yield in rubber, actual tapping of mature trees during the greater part of their economic life still remains the only reliable method of testing clones for yield. A *Hevea* budding normally reaches tappable size at approximately six years of age. But the growth as well as yield continues to increase for a further period depending on the nature of the clone. In addition to yields realised on virgin bark, a suitable selection should also give economic yields when tapping renewed bark. This stage is normally reached approximately 14 years from first tapping. The initial selection of a clone for yield therefore involves a minimum period of 20 years from planting. Selection for yield under large scale planting is further complicated by a trend towards decreasing yields with increase in plot size. Many of the RRIC selections in small scale trials have given projected yields in excess of 4,000 lb dry rubber an acre while under large scale planting, this yield has reduced by over 50%.

However, within the limitations set by the very nature of this crop, the history of developments in our planting material has been one of steady progress. The impact of these developments on the rubber industry in Ceylon is reflected in the average yields recorded in estates, which from around 300 to 400 lb an acre in the post-war years, have progressed to over 1,500 lb an acre within the past 30 years. The targets achieved by us in this field assume greater significance if we take into account the variety of diseases we have to cope with, the eroded steep terrain in which our rubber is grown and our climatic conditions which hinder the full exploitation of our planting material.

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QUESTIONS AND ANSWERS

- Question: The yield slide of RRIC 100 showed a sharp decline in yield in the third year —
- (a) Can this decline be expected to continue ?
- (b) What is the cause of this sharp decline ? (Mr. Sepala Ilankoon)
- Answer: (a) We would not expect this decline to continue.
- (b) The decline is probably due to environmental conditions. The same trend was shown by the control clone PB 86.
- Question: Have you found any difference in the quality of the rubber in the different clones? (Mr. L. C. de Mel)
- Answer: The latex properties can vary in different clones.
- Question: Development in *Hevea* planting material —
- (a) With regard to clone RRIC 89 which gives a yield of over 2,000 lb dry rubber per acre, on which elevation was this clone grown and at what rainfall (per year)? (Mr. R. S. Howie)
- Answer: (a) Elevation — approx. 200 ft above sea level.
- (b) Rainfall — around 170 in. a year.
- Question: From your talk it appears that your contention was that PB 86 is sub-standard in yield data when compared with all the other clones enumerated by you in your address.
- Could we know as to whether you drew your conclusions from definite commercial plantings in Ceylon and as to whether they could be depended on for future large scale plantings ? (Mr. C. N. M. Rodrigo)
- Answer: A majority of the clones described are very recent selections from large scale trials where PB 86 is used as the control clone. These are now recommended for small scale plantings in estates. The question of large scale planting of these clones would depend on their performance in these small scale commercial plantings.
- Question: What does the Institute presently recommend as substitute for establishing seedling nurseries today, with the diminishing availability of the recommended clonal seed Tjir 1? (Mr. G. A. Wells)
- Question: In the absence of Tjir 1 seed what would you recommend as a substitute in seedling nurseries of the freely available clones on estates ? (Mr. H. G. S. Mendis)
- Answer: The present indications are that the seed of most recommended clones could be used as stocks except perhaps those of clone PB 86 which is still being evaluated.