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THE YIELDS AND SECONDARY CHARACTERS OF CLONE RRIC 102

BY

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SUMMARY

The background of plant breeding in the Rubber Research Institute of Ceylon is briefly outlined. The selection of RRIC 102 for planting in successively larger replicated plots on the basis of early indices of yield, and resistance to Oidium *leaf disease, is discussed. The early information obtained thereby on the yields of this clone, and its success in* Oidium*-affected areas, is presented; its possible use in extending the limits of rubber replanting to areas above 1,000 ft elevation is discussed.*

INTRODUCTION

In describing the origin of this clone, it is necessary to go back to early work in West Java where van der Hoop, under the guidance of Steinman, established commercial seed gardens which supplied the well known Tjikadoe selected seed. This seed was imported to Ceylon in the early thirties as at that time seedlings of suitable improved performance were felt to be easier to establish and maintain than budded plants. From such a seedling field at this Institute the higher-yielding mother trees were multiplied and subjected to further tests. Finally, Tjikadoe seedling No. 103 was selected from the 1935 clearing at Nivitigalakele for further test in the 1943 and 1949 clearings at Hedigalla. This clone was then labelled RRIC 52 and exhibited resistance to *Oidium* leaf disease and vigorous growth but rather low yields in the first tapping years.

Initial plant breeding programmes in Ceylon (from 1939 to 1945) directed by the Geneticist, Dr. C. E. Ford, utilized a very wide selection of clones originating from Ceylon, Malaysia, Indonesia and Vietnam: analysis of these trials from 1952 provided data for the favourable combining ability of a few clones such as Tjir 1, Mil 3/2, Wagga 6278, RRIC 7, RRIC 8, LCB 1320, PR 107, PB 86 and PB 5/139. The selection of these parental combinations made it possible to concentrate on obtaining an appreciable number of seedlings from a desired combination. Parallel with this analysis the favourable growth and foliage of RRIC 52 was noted; preliminary studies on RRIC 52 seedlings showed that the vigour of this clone was highly transmissible. Therefore RRIC 52 was combined at this stage with clones such as RRIC 7, PB 86, PB 5/139, and Ch 26 in order to raise yields to more economic levels and incorporate more favourable secondary characters.

RRIC 102 emerged as a selection from one of these combinations, *viz.*, RRIC 52 × RRIC 7 synthesized in 1956, its original clone number being 1103.

SELECTION FOR *OIDIUM* RESISTANCE

The spread and severity of *Oidium* leaf disease has led to the abandoning or conversion of nearly 100,000 acres of upland rubber in Ceylon and the withdrawal of subsidy for all rubber plantings at elevations above 1,000 ft. As tea prices prior to 1965 (figures issued by the Central Bank) have been satisfactory, an alternative subsidy for replanting tea on these rubber lands was quite effective. With the later drop in tea prices, accompanied by some stabilization of the rubber market, increased interest is being displayed in the replanting of rubber again in these areas. An effort was made in 1953 to introduce clones resistant to *Oidium* leaf disease but the

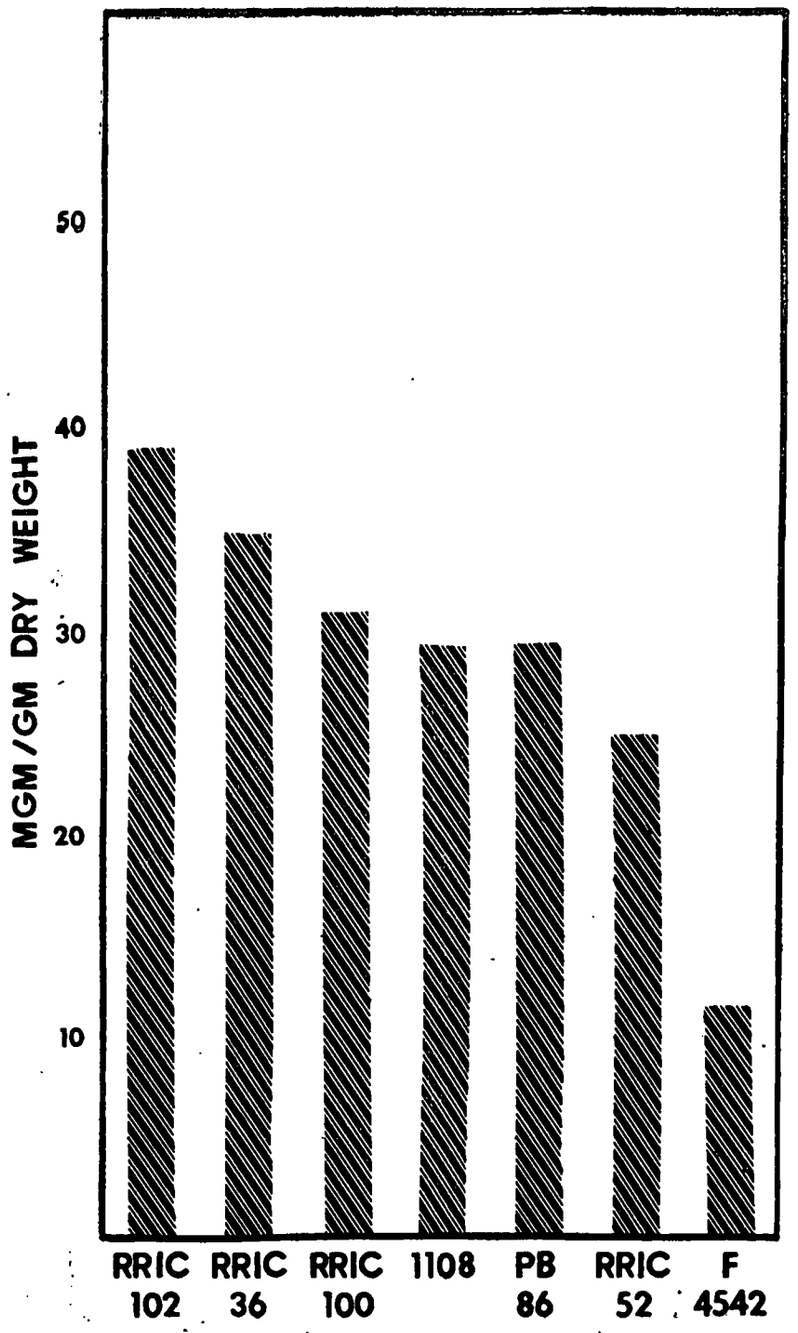

Fig. 1. Early estimates of latex content in petioles leading to extended trial of RRIC 102.

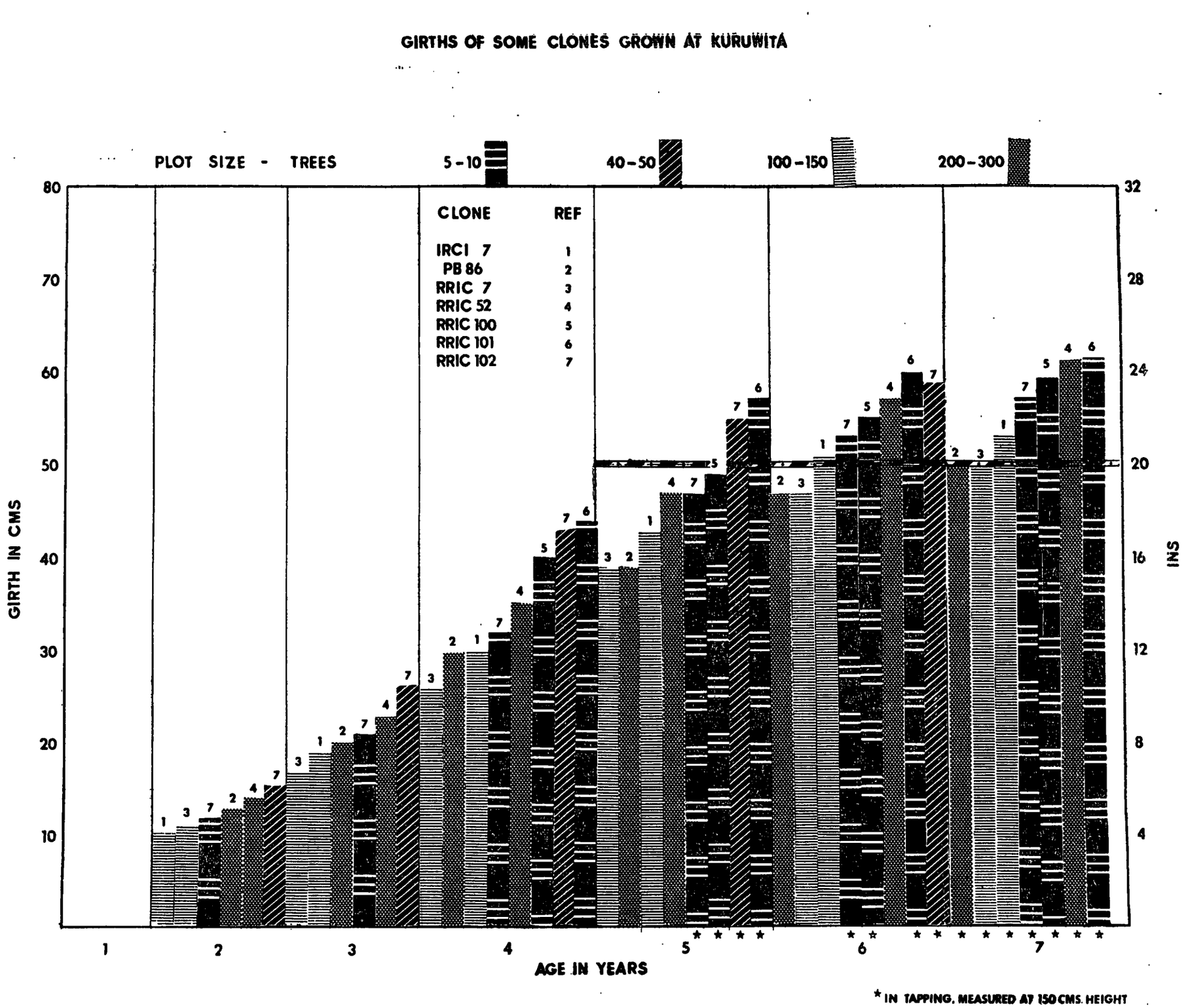

Fig. 2. The girths of RRIC 102 and some other popular clones planted at the sub-station at Kuruwita.

first clone used for this purpose (LCB 870) was found to be a failure on the basis of yields. No further selections emerged with a combination of resistance and yield until the discovery of resistance and vigour in RRIC 52. However, the yields of RRIC 52 were not sufficiently high to merit approved distribution on a large scale in the drier areas. Therefore selection was initiated on material evolved from the combination of RRIC 52 with high-yielding clones such as RRIC 7, Ch 26, PB 5/139 and PB 86.

The seedling progeny from families obtained by artificial pollination was initially planted at Nivitigalakele for observations at the nursery stage on possible resistance to leaf disease and early yield indices. In 1959 and 1960 a very close planting was established at Keppitigala Group, at an elevation of 1,200 ft, under conditions very suitable for the development of *Oidium* leaf disease. Two hundred and sixty eight selections made from seedlings of hand-pollinated origin were included in this trial in addition to budgrafts from 111 *Dothidella*-resistant selections imported from Brazil. Assessments of resistance to *Oidium* leaf disease were made from time to time (Wijewantha, 1965; Fernando, 1969) and two clones, 1103 and 1108 of RRIC 52× RRIC 7 parentage emerged, amongst others, as tolerant to *Oidium* leaf disease, as there was no leaf fall immediately after refoliation and no evident severely affected leaflets on these clones.

Apart from the observations on leaf fall, the ability of the clone to grow under the general conditions obtainable in the planting districts above 1,000 ft has also to be considered. Therefore initial observations were followed by further trials at even higher elevations.

EXTENSION OF EXPERIMENTAL PLANTINGS

In view of continued evidence that RRIC 7 was a very satisfactory parent for yields, and the very small number of selections found resistant to *Oidium* attack at Keppitigala, it was decided to plant clones 1103 and 1108 in two additional ten-tree plots at Kuruwita Sub-station and Nivitigalakele Division, in 1962. At the same time, in the course of studies aimed at improving methods of estimating latex content of leaves and leaf stalks, clones 1103 and 1108 were repeatedly screened and 1103 yielded consistently higher readings of latex content. The readings noted, using the method of Fernando & Samaranayake (1967, 1968) are given in Fig. 1. These positive indications of promising yields stimulated further multiplication of the clone 1103, and two 30-tree plots were planted as part of a clone trial in Matale in 1963 at an elevation of 1,400 ft: two more 30-tree plots were planted in Kuruwita in 1964: four 10-tree plots were planted at Moneragala in 1965, and six 100-tree plots were planted in the Kalutara District in 1966, coinciding with the first year of tapping of this clone.

GROWTH

Early measurements of growth revealed that a rate of 4 in. per year was easily attained in this clone. On this basis, a number of trees had been brought into tapping in the 1961 clearing at four and a half years of age where a minimum of 16 in. girth had been recorded at four years of age: this early opening was initiated subsequent to the observations of Barlow & Ng (1965) that earlier opening of tapping cuts representing earlier return from capitalization, is of great importance in increasing profitability. The RRIC 102 trees were similarly opened at five years of age instead of the usual seven years to maturity.

A further desirable characteristic of this clone is the increase of girth after tapping. It is seen from Fig. 2 that this increase is appreciable for at least the first few years of tapping so far observed.

This clone, along with other *Oidium*-tolerant selections of lesser yield potential, was planted at Matale in 1963, and again in 1965 as three five-tree replicates in a test clearing in the Kalutara District. As shown in Fig. 3, values of girth of the trees brought into tapping in 1970 in both clearings showed no significant difference in the case of RRIC 102 and the three other clones. It was not possible to bring any trees of the control clone PB 86 into tapping at Matale in the same experiment. In planting this clone at elevations above 1,000 ft, it would appear that set-back of one to two years should be expected when grown at higher elevations. The increased growth rate of RRIC 102 would make it possible to exploit it at seven years of age at the higher elevations whereas the earlier clones such as PB 86 may take about two years more. In the Kalutara, Kelani Valley and Sabaragamuwa Districts opening of tapping cuts at five years of age is quite possible.

YIELDS

The original two ten-tree plots at Kuruwita and at Nivitigalakele were tapped from 1967 on S/2, d/3, 67% intensity and from 1969 on S/2, d/2, 100%. The trees were sampled twice a month and the samplings dried, weighed and recorded as grammes of dry rubber per tree per tapping.

As shown in Fig. 4, the yields are very satisfactory and the girths of the larger plot (of which 41 trees were tapped) were even higher than the girths of the two ten-tree plots. As two large plots were available the yields and corresponding girths of two parallel rows of trees of RRIC 102 and clone 1108, of the same parentage, were analysed from measurements taken in 1969. The actual control clone, PB 86, could not be brought into tapping at this time; hence 1108 of the same parentage and degree of resistance to *Oidium* leaf disease was selected for comparison, as the land was sufficiently flat for a direct comparison. The mean girths of 30 trees of each clone were 48·5 cm (RRIC 102) and 50·7 cm (1108); these girths did not show a significant difference at the 5% level. The corresponding mean yields were 53·8 g and 32·2 g per tree per tapping for the two clones; this difference in yield was highly significant at the 5% level. A similar comparison between the girths of a 30-tree plot of PB 86 and an adjacent plot of clone 1108 showed mean girths of 46·5 cm and 39·0 cm respectively; this difference was highly significant at the 0·01% level.

The increase in yields is not pronounced from year to year as in RRIC 100. Such a gradual increase is more desirable in early assessments as large increases frequently lead to dry trees unless tapping intensities are suitably modified.

As shown in Fig. 4, a first year yield of 500 lb per acre per year could be expected if tapped on the third-daily system; a second year yield of 800 lb and a third year yield of 1,300 lb on the alternate-day system or about 1,100 lb per acre on the third-daily system, could be expected of this clone, giving sufficient correction for larger scale plantings: these yields compare very favourably with RRIC 45 and RRIC 52 planted in the same estate. As also seen from Fig. 4, there is an appreciable increase of girth after tapping in comparison with RRIC 45; this increase is similar to that of 1108 which is of the same parentage and of a sufficient vigour for comparison.

OTHER SECONDARY CHARACTERS

Wind damage: In recent years wind damage has assumed greatly increased importance owing to the necessity of maintaining a clearing in conditions of maximum productivity. In many cases this has been shown to be a clonal character as in the susceptibility of LCB 1320 and resistance of PB 5/51. The withdrawal of large amounts of latex from high-yielding clones could be expected to increase susceptibility to wind damage, unless countered by resistance factors such as wood fibre strength or type of branching. RRIC 102 is seen to have inherited the type of branching angle and adhesion of RRIC 52: mature trees of RRIC 52 have definitely shown a lack of susceptibility to main branch damage on this basis. Exposure of two 30-tree blocks to a brief cyclonic storm in 1967, which resulted in wind damage

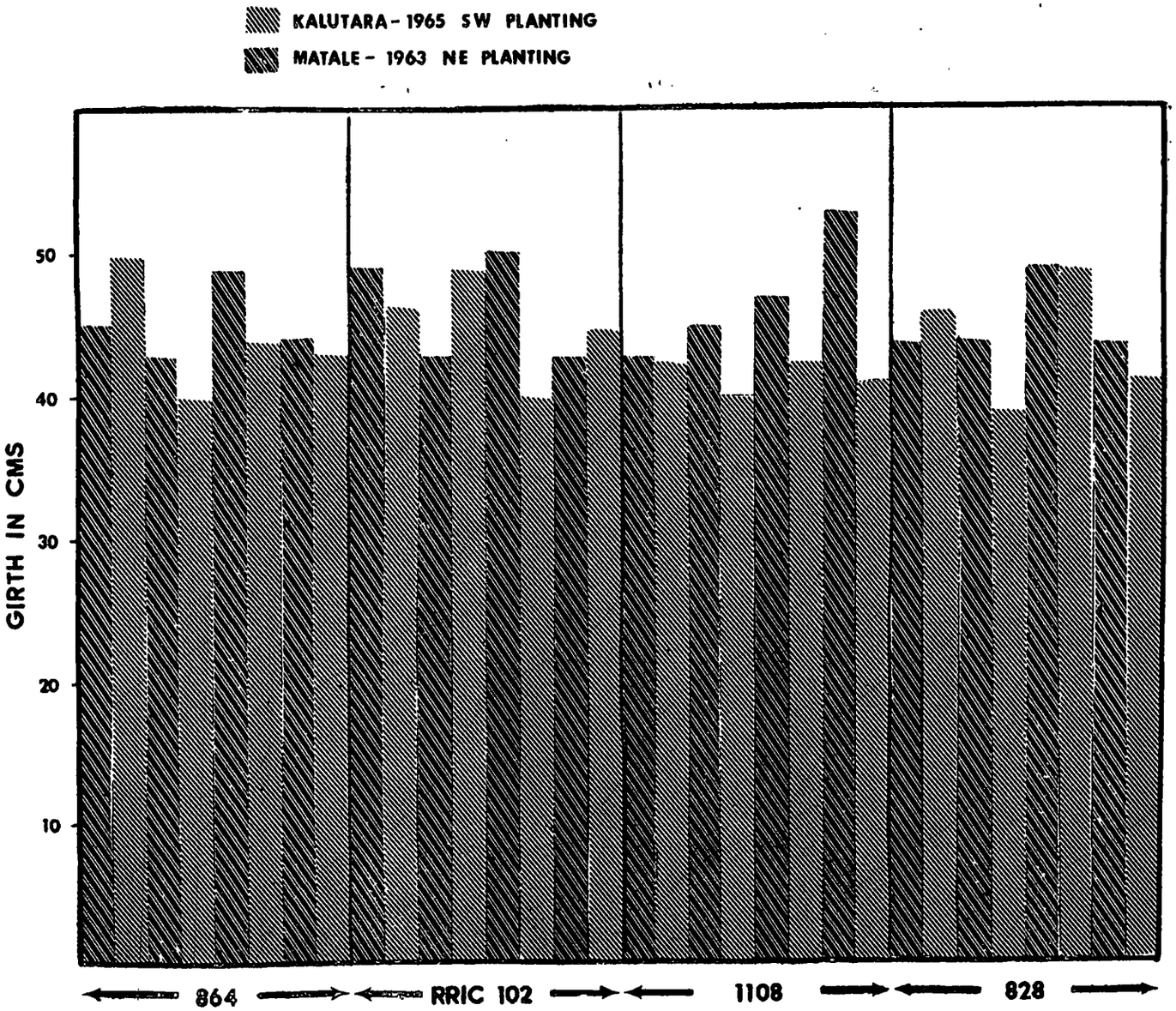

Fig. 3, Individual girths of trees brought into tapping simultaneously at Kalutara (1965 planting) and Matale (1963 planting).

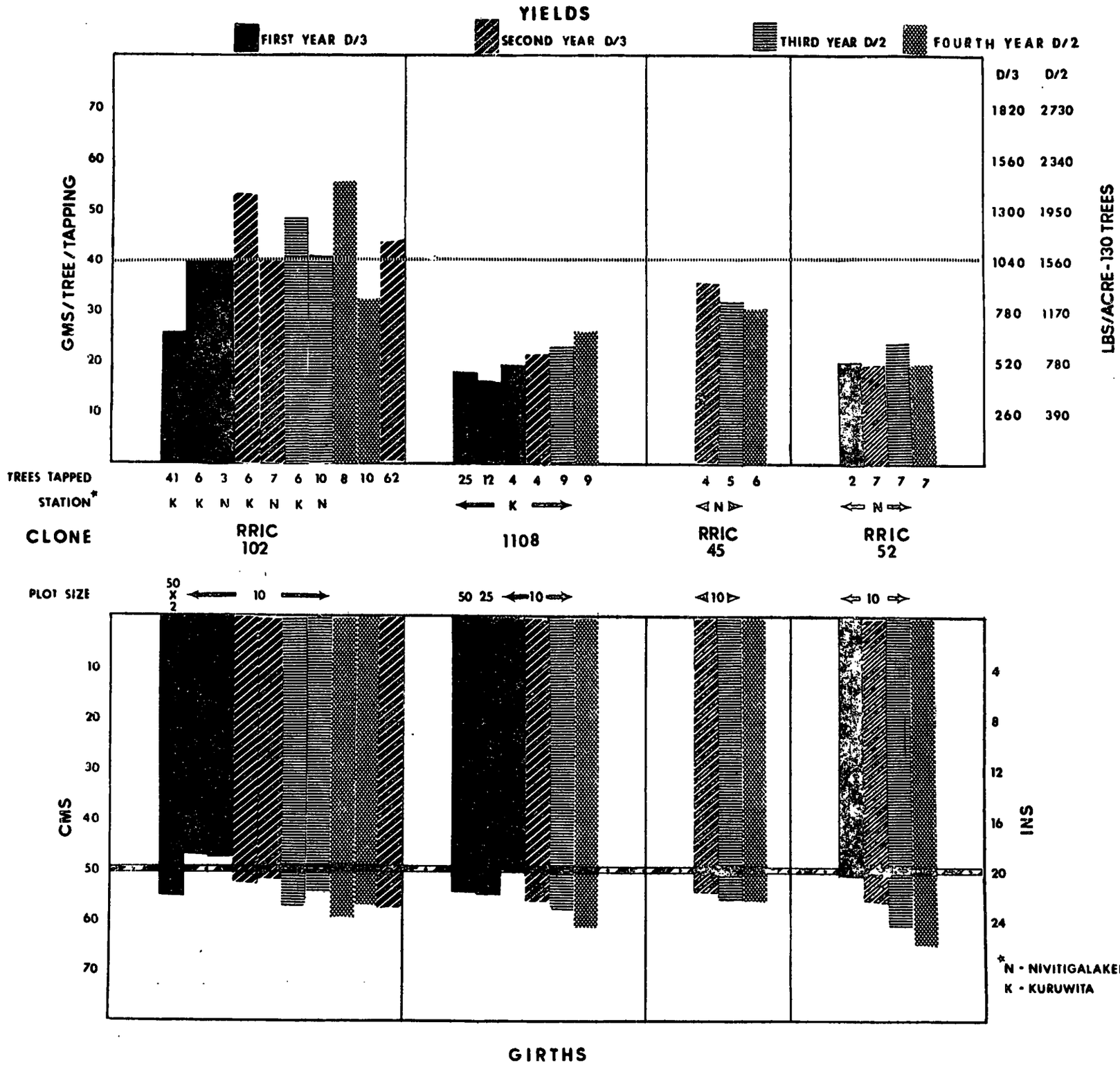

Fig. 4. Comparison of yields and growth of RRIC 102 and other clones in the same clearings.

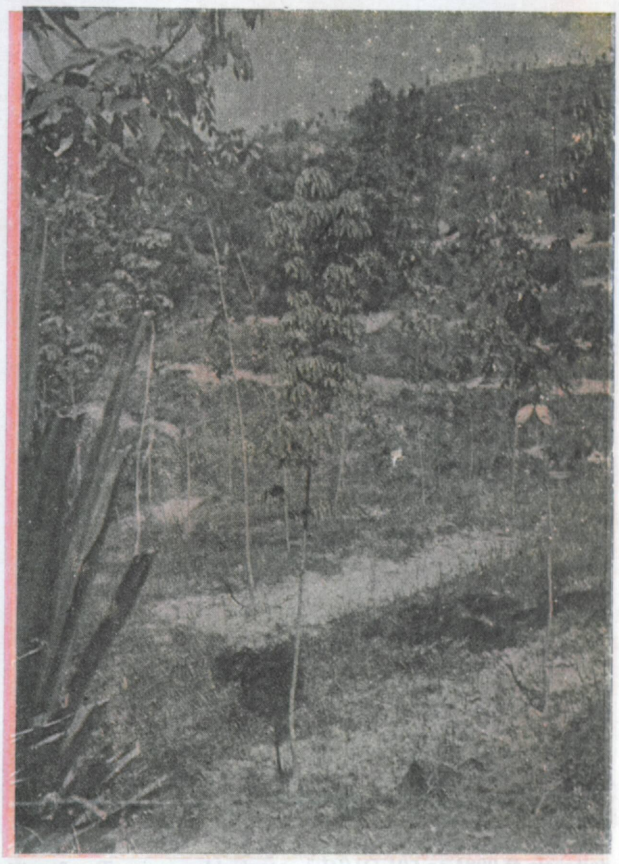

Fig. 5. Two-year old plants of RRIC 102 at 1800 ft elevation in the Gampola District.

and uprooting of a number of trees in the 1964 clearing at Kuruwita Sub-station, caused no damage to RRIC 102; later observations reinforced this view but the clone has not been tapped for a sufficient number of years for a definite assessment of wind damage resistance to be made.

Bark renewal: Bark renewal is satisfactory and the virgin bark does not show susceptibility to Bark Rot.

Disease resistance: The fruit-set in this clone has been found to be relatively poor; this would indicate reduced susceptibility to *Phytophthora* leaf fall.

In the context of the current attempts to replant elevations above 1,000 ft with rubber, the resistance of this clone to attack by *Oidium heveae* is of major importance. As mentioned earlier some delay has to be expected in opening trees at the higher elevations owing to lower rainfall: however, satisfactory foliage would enable the crop to be established and ensure better renewed bark.

DISCUSSION

Of the newer clones synthesized in Ceylon, this is the first instance of a relatively large number of trees coming into tapping so soon after primary test. If this clone is taken into tapping at five years of age, it would appear to be more advisable to adopt the S/2, d/3, 67% intensity of tapping for the first five years. Three years tapping on 67% intensity is usually advised for higher-yielding clones brought into tapping at seven years of age. In the case of early openers, five years reduced intensity would also only amount to this same ten-year period, though inclusive of an additional two years exploitation.

With the distribution of budwood from 1970, wider use of this clone could be expected in 1972 and 1973. The commencement of tapping in 1970 on two 30-tree plots, planted in 1963 at an elevation of 1,400 ft, should yield reliable data regarding the yields of this clone at the higher elevations.

As shown in Fig. 5, the foliage of a two-year old plant at 1,800 ft elevation is very satisfactory and the prospects of moving subsidized replanting of rubber to areas in Ceylon above 1,000 ft seem very promising.

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QUESTIONS AND ANSWERS

Question: Apart from RRIC 102 what other clones can be recommended for the Koslanda area from your experience? (Mr. W. W. J. Mendis)

Answer: RRIC 102 is the only local selection which has shown adaptability to drier conditions and sufficient resistance to *Oidium* leaf disease for planting in the Koslanda District. An imported clone IAN 45—710 has also shown suitability for the Koslanda District, but the yields of RRIC 102 are higher. However both these clones are recommended for planting in areas previously considered unsuitable for the replanting of rubber.