J. Natn. Sci. Coun. Sri Lanka 1974 2(2) : 157-160

Growth of Nursery Rootstock Seedlings of *Hevea brasiliensis* Muell. Arg. *Cv.* Tjir 1. Part III*

Y. D. A. SENANAYAKE

Department of Crop Science, Faculty of Agriculture, University of Sri Lanka, Peradeniya Campus, Peradeniya, Sri Lanka.

AND

P. SAMARANAYAKE

Rubber Research Institute of Sri Lanka, Agalawatte, Sri Lanka.

(*Paper accepted* : 31 *December* 1974)

Abstract : A trial was conducted to determine the nature of growth of seedlings of rubber (*Hevea brasiliensis cv.* Tjir 1) a cultivar which has been widely used as a rootstock. At 32 months, a sample of seedlings which represented all the germination classes was removed from the nursery and the dry weights of their roots, stems and leaves were determined. Three parameters of growth namely, the plant height and stem diameter at first measurement and root lengths showed a high positive correlation with the dry weights of the plants and their component parts. Rootgrowth even had an influence on the dry matter production of the leaves. It is suggested that the variation in the growth of the budlings could be caused by the genetic heterozygosity of the roots which would also cause differential growth of the aerial parts of the plant.

1. Introduction

Plantation rubber, *Hevea brasiliensis* is multiplied vegetatively by budgrafting proven cultivars on to recognised seedling rootstocks. The expectation of obtaining uniform growth and yields from among the trees of a vegetatively propagated population is not realised even under the best conditions of management. There is variation in growth and yield between trees even in small monoclonal blocks. The low yielders which contribute to part of this variation reduce the profitability of estates as they would increase the cost of tapping per tapping task. In small holdings, they reduce the total yield of latex per tapping day and consequently lower the income of small holders.

McIndoe,[2] and Senanayake and Wijewanthe[4] have suggested that part of the variation in growth and yields may be associated with the inherent variability of the heterozygous, seedling roctstocks. To examine this view, an investigation was conducted to study initially the nature of variation in the growth of rootstock seedlings in a nursery. The nature of variation in the growth of such seedlings has been reported recently by Jayasekera and Senanayake[1] and Senanayake *et al.*[3] This paper examines the inter-relationships which were recognised among some parameters of growth at the time of removal of the seedlings from the nursery at maturity.

* For details regarding publication of parts I and II, see **References.**

2. Materials and Methods

Descriptions of the experimental material and the nursery management methods have been reported earlier.[1] When the plants were 32 months old, 190 of them that were derived from different germination periods that ranged from 12 to 34 days (Table 1) were uprooted from the nursery carefully to expose the entire main root and all the branch roots. The plants were then removed immediately to Peradeniya where the total dry weight of the root, stem and leaves was determined by drying the plants to constant weight in a Unitherm drying oven. The plants were removed for dry matter determination in 3 batches on 18 July, 27 July and 8 August 1972.

TABLE 1. Nature of sample used to determine dry weight.

Germination class (days)	12	13-14	15-16	17-18	19-20	21-22	23-24	25-26	27-28	29-30	31-34
No. of plants analysed	4	5	10	44	40	25	28	15	11	6	2

3. Results

The associations between 4 parameters of growth namely : (1) germination period, (2) plant height at first measurement, (3) stem diameter at first measurement and (4) root length and the nature of growth such as (*a*) root length ; (*b*) root dry weight ; (*c*) stem dry weight ; (*d*) leaf dry weight and (*e*) the total plant dry weight are presented in Table 2.

TABLE 2. Correlation between parameters of growth and nature of growth.

Nature of growth / Parameter	Root length	Root dry wt	Stem dry wt	Leaf dry wt	Total plant dry wt
Period of germination	0.0010	—0.0661	—0.0334	—0.0449	—0.0451
Plant height at first measurement (1969-10-15)	0.1121	0.2096*	0.2156*	0.2045*	0.2189*
Stem diameter at first measurement (1969-10-15)	0.1485	0.2258*	0.2105*	0.2720**	0.2263*
Root length		0.5872***	0.5028***	0.4015***	0.5364***

*, **, *** – Significant at 5%, 1% and 0.1% respectively.

Negative and non significant low correlations were obtained between the period of germination and the dry weights of the plant parts. During growth, a positive and significant correlation was found between the height of the seedlings recorded during the first measurement on 15 October 1969 and the total dry weight of the plant or the dry weights of the different plant parts such as the root, stem and leaf. The stem

diameter of seedlings recorded during the first measurements on 15 November 1969 also showed similar correlations. The height or the diameter of the seedlings during the first measurement showed low positive correlations of 0.1121 and 0.1485 respectively with the root length.

Positive and very highly significant correlations of 0.5872, 0.5028, 0.4015 and 0.5364 were obtained between root length and the dry weights of the root, stem, leaf and the whole plant respectively.

4. Discussion

The illegitimate seeds which were used in this experiment germinated during a period extending from 12 to 34 days. During this period, the proportion of plants which germinated within the different germination classes was found to fit a normal curve which was skewed to the left.[1] The sample used for analysis in the present study was representative of these germination classes.

The negative correlations of the period of germination with the dry weights of the root, stem and leaves suggest that if the germination period is small, the dry weights of the plants or their components are large. It could be suspected, therefore, that this relationship is genetical and that the early germinators had an inherent capacity for higher production of dry matter.

The positive and significant correlation of either the plant height or the stem diameter at first measurement with the dry weight of the plant or its parts indicates that the more vigorous plants have a higher dry matter production. The data show that such plants also had larger roots although the association was not significant. The intervening period between the first measurement of the seedlings in the nursery and uprooting the plants for the determination of dry matter was 32 months. Early vigour, therefore, had not arisen because of the seed environment but it was due to superior vigour which was probably associated with genetical causes. From previous results, Jayasekera and Senanayake[1] have suggested that either the plant height or the stem diameter could be used as a measurable parameter because of their high positive correlation. The results reported here confirm this relationship.

A strong positive correlation between the root length and the root dry weight of a plant is not unexpected. An interesting result in this study, however, was the strong association between the root length and the dry weight of the stem and even the leaves. Such an influence could therefore contribute to the variability of the growth of the scions of budded rubber plants even within small monoclonal blocks. Root growth was associated with the germination period. Moreover, it has been shown in a previous report by Senanayake *et al.*[3] that seedlings which germinated early continued to have a higher growth rate in the nursery. These results, therefore, lend support to the viewpoint that genetic heterozygosity of the rootstocks is the cause of part of the plant to plant variation that is recognisable during the growth of budded trees.

Acknowledgements

The authors sincerely thank Mr. D. M. Fernando, Head, Department of Genetics and Plant Breeding for providing the necessary assistance for this study and Mr. J. Gunasekera of the Rubber Research Institute of Sri Lanka and Mr. M. S. Marasinghe of the State Engineering Corporation Computer Services for analysing the data.

References

1. JAYASEKERA, N. E. M. & SENANAYAKE, Y. D. A. (1971) *Q. J. Rubb. Res. Inst. (Ceylon)* **48** : 66-81.
2. MCINDOE, K. G. (1958) *Q.J. Rubb. Res. Inst. (Ceylon)* 34 : 49-57.
3. SENANAYAKE, Y. D. A., JAYASEKERA, N. E. M. & SAMARANAYAKE, P. (1974) *Q. J. Rubb. Res. Inst. (Ceylon)* 54 : Accepted for publication.
4. SENANAYAKE, Y. D. A. & WIJEWANTHE, R. T. (1968) *Q. J. Rubb. Res. Inst. (Ceylon)* **44** : 16-26.