

# A NOTE ON TRANSPLANTING OF BUDDED STUMPS OF HEVEA

BY

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In the Annual Report of the Botanical Division for 1931 (1) reference was made to the preliminary results of an experiment on the influence of the retention of lateral roots on the shooting of budded stumps. Observations were continued into 1933 and the results can now be given in more detail.

Ostendorf in 1931 (2) published observations on the development of young *Hevea* buddings in Java. A series of seedling stocks was budded with clones A.V.R.O.S. 50 and Cultuurtuin 88. One-third was left undisturbed, one-third dug up immediately after cutting back and replanted with as many lateral roots as possible, and the remainder replanted after the removal of all lateral roots. The buds on the undisturbed plants were the first to shoot and those on the stumps transplanted without side roots were the last. For both clones the time taken for half the buds to shoot was about 10 to 14 days shorter for the stumps with lateral roots. The progress of shooting of both clones is shown in Fig. 1.

Such a difference in the rapidity of shooting of budded stumps after transplanting, especially if the advantage is maintained in the subsequent growth of the shoots, may be of great importance if budded stumps have to be transplanted late in the season or shortly before a period of dry weather. It was therefore considered desirable to follow up Ostendorf's results under Malayan conditions.

## Experimental Material and Methods

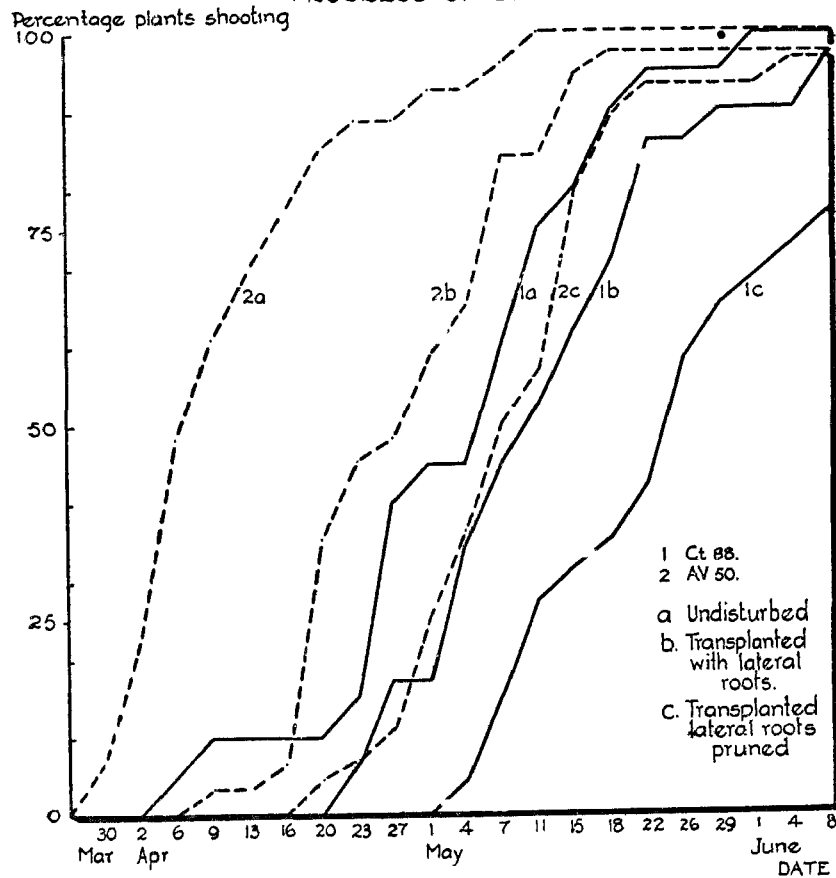
Seedling stocks of mixed origin about 20 months of age, were budded between the 7th and 16th September 1931 with buds from clones A.44 and B.84 (Pilmoor) and clone A.V.R.O.S.50. Bandages were opened on the 1st October and the stocks of successful buddings were pruned off at a height of 4 inches above the grafted buds on October 13th 1931. Following our standard practice for planting of budded stumps, the buddings were allowed to remain undisturbed

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\* The work described in this paper was initiated by Mr. L. E. Morris and the report has been drafted by him. The final measurements and the completion of the report has been undertaken by members of the Staff of the Botanical Division.

Fig. 1

BUDED STUMPS - CLONES Ct. 88 & AV205 50.  
PROGRESS OF SHOOTING.



(After Ostendorf)

for a period of 10 days in order that the pruning cut (snag) might become partially healed and the grafted bud stimulated and swollen in preparation for shooting. On October 23rd and 24th the bud-dings were carefully dug up and prepared for immediate transplanting. The budded stumps were divided into three groups; in one set all lateral roots were completely removed, in the second the laterals were cut back to six inches from the tap root, and the third group was left with twelve inches of side roots which in many plants included a good deal of fibrous root. The planting holes had already been prepared so that filling and transplanting were carried out in one operation, treading the soil in firmly and taking care to keep the lateral roots horizontal as far as possible.

The numbers of the stumps of the three clones and three groups of root lengths are shown in Table I.

TABLE I  
*Numbers of budded stumps transplanted*

CLONE		Lateral Root Length		
		12 inches	6 inches	0 inches
A.V.R.O.S. 50	...	30	31	27
Pilmcor A. 44	...	17	19	19
Pilmoor B. 84	...	26	22	21
Tota (all clones)	...	73	72	67

### Results

Observations on the shooting of the buds and measurements of the length of the scion shoots were started two weeks after planting, and continued twice a week until the beginning of January 1932. Later inspections and measurements were made during February and November 1932.

1. *Observations on the influence of the severity of the initial root pruning on the rate of shooting of transplanted budded stumps*

The rate of shooting can be considered in two ways, either as the mean time taken for all the buds to shoot or as the number of buds shot in a given time. The results of the observations are set out in Tables II and III. In some plants the production of an actual shoot was considerably delayed beyond the first signs of breaking of the bud, and for these a mean time has been taken.

TABLE II  
*Comparison of rates of shooting of grafted buds*  
*Mean time taken, in days, for all living plants to shoot*

CLONE		Lateral Root Length		
		12 inches	6 inches	0 inches
A.V.R.O.S. 50	...	29.7 days	25.5 days	28.2 days
Pilmoor A. 44	...	19.6 ..	20.7 ..	26.3 ..
Pilmoor B. 84	...	25.0 ..	25.1 ..	40.7 ..
Mean (all plants)	...	25.9 ..	24.5 ..	34.0 ..

The results summarised in Table II show that on the average, the stumps with lateral roots shot from 8 to 10 days earlier than those without. The difference is most marked in clone B. 84 and least in A.V.R.O.S. 50 in which the stumps with long lateral roots took as long to shoot as those with no lateral roots.

The standard errors of the mean times of shooting are given below, together with the greatest difference between stumps with roots and no roots and the standard error of that difference. For clone A.V.R.O.S. 50 the difference is less than its standard error, and for clones Pilmoor A.44 and B.84 the differences are about 1.5 and 1.9 times the standard errors. None of these differences is completely significant when taken alone, but all are in the same direction and the total result can be regarded as significant.

CLONE	Standard errors of means - days			Greatest difference roots and no roots	Standard error of that difference
	Root lengths				
	12 ins.	6 ins.	0 ins.		
A.V.R.O.S. 50	3.0	2.4	2.3	2.7	3.3
Pilmoor A. 44	1.5	1.9	4.3	6.7	4.6
Pilmoor B. 84	3.8	6.2	4.0	14.4	7.4

TABLE III

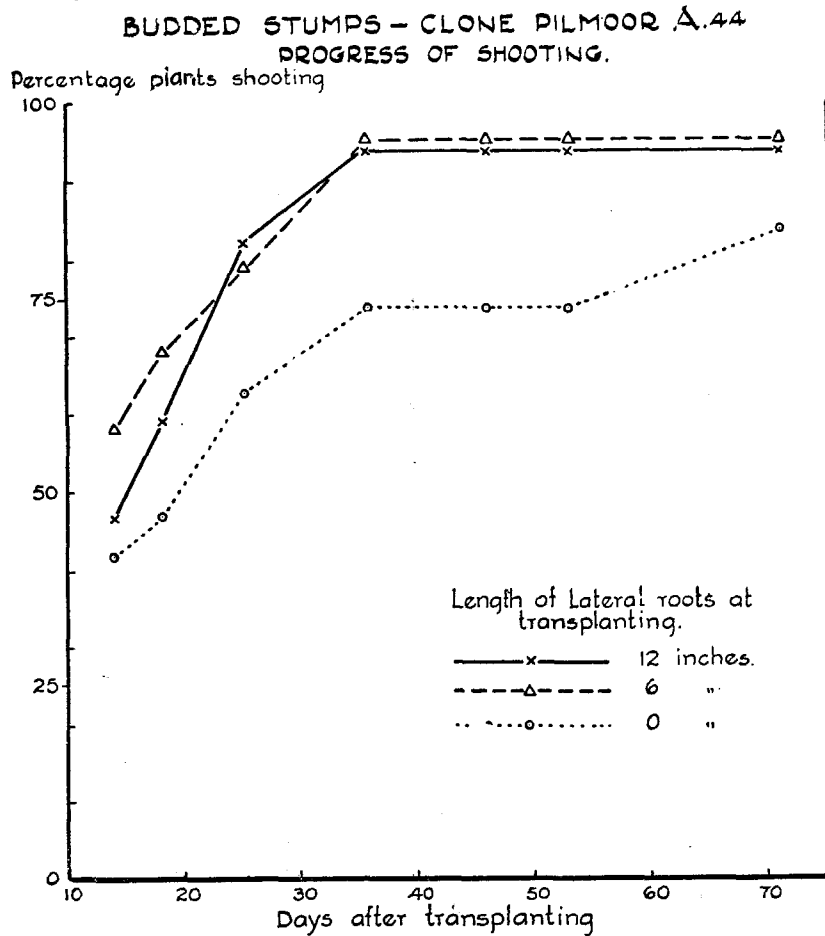
*Comparison of rates of shooting as shown by percentage of stumps shot after 25 and 53 days from transplanting*

CLONE	After 25 days Lateral root length			After 53 days Lateral root length		
	12 ins.	6 ins.	0 ins.	12 ins.	6 ins.	0 ins.
A.V.R.O.S. 50	50	71	41	80	94	96
Pilmoor A. 44	82	79	63	94	95	74
Pilmoor B. 84	50	55	19	73	91	76
Mean percentage of all plants	57	68	40	81	93	84

Table III shows the numbers of buds that had shot on November 17th and December 15th at 25 and 53 days after transplanting. At the earlier date the plants that had retained their lateral roots appear to possess a clear advantage over those that have been completely root pruned. Later, the differences shown are very small.

Observations taken at four months from the date of planting showed no significant differences between the final percentages of buds shot. At this time the percentage number of successful plants in the three classes was 88, 96 and 93 for buddings with long, medium, and no lateral roots respectively. The progress of shooting in clone A.44 is illustrated in Figure 2.

Fig. 2.



2. *Observations on the influence of the degree of root pruning at planting and subsequent growth*

The next point to be examined is whether early shooting produces a permanent effect on subsequent growth and in Table IV the mean lengths of the scions on 22.12.31, 19.2.32 and 3.11.32, i.e., at two, four and twelve months after transplanting, are summarised.

TABLE IV

*Comparative rates of growth of scions of budded stumps planted with different lengths of lateral roots. Records of mean growth in height of scions measured in inches*

CLONE	Initial Length of Lateral Roots in inches		
	12 inches	6 inches	0 inches
A.V.R.O.S. 50	15.0	15.7	11.5
Pilmoor A. 44	10.5	10.3	7.7
Pilmoor B. 84	17.2	19.3	10.1
*Mean height at 2 months	14.8	15.4	9.9
A.V.R.O.S. 50	31.8	30.4	22.9
Pilmoor A. 44	24.2	20.3	16.3
Pilmoor B. 84	33.8	32.6	21.0
*Mean height at 4 months	30.6	28.5	20.7
A.V.R.O.S. 50	130	125	97
Pilmoor A. 44	76	66	50
Pilmoor B. 84	114	112	83
*Mean height at 1 year	112	106	81

\* Note :—The mean heights for each period are calculated from the total growth of all buddings irrespective of clone.

The figures given are the means for the stumps that had shot; those with dead or still dormant buds are not included. The records show a clear superiority in growth of the stumps transplanted with lateral roots over those without. At both of the first two measurements the average shoot length is 50 per cent. greater and after a year it is still 30 per cent. greater. The actual difference has increased from 5 to 10 inches between the first two measurements and to 30 inches between the second and third measurements. It is evident that the initial advantage of earlier shooting is reflected in the more rapid growth of the scions during the first year.

Statistical examination of the detailed figures shows that the standard errors of the means for scion growth in clone A.V.R.O.S.50 on February 19th 1932 are 1.5, 1.3 and 1.9 respectively. Thus the growth of buddings transplanted with lateral roots is significantly better than the growth of plants whose lateral roots have been completely removed before replanting. There is no significant difference in growth between the plants retaining lateral roots 6 inches long and those retaining lateral roots 12 inches long. In November 1932 the difference in shoot length between the groups transplanted with 12 inch lateral roots and those with no lateral roots was 33 inches and the standard error of this difference was 8.25 inches. This difference is therefore fully significant.

When the final observations were taken in June 1933 the percentage of vigorously growing buddings was greatest in the group transplanted with lateral roots pruned to six inches. The actual figures were 12 inch lateral roots, 92 per cent.; 6 inch lateral roots, 97 per cent.; no lateral roots, 87 per cent.

### Conclusions

Under the conditions of this experiment it is demonstrated that, in the practice of transplanting budded stumps, the retention of lateral roots has a decidedly beneficial effect on the rate of shooting and subsequent vigour of growth of the scions during the first two years.

Fewer deaths occurred when lateral roots were retained at transplanting.

For large scale operations the difficulty of transplanting budded stumps with large amounts of lateral root is appreciated so that when large budded areas are being developed the initial budding work is generally carried out on seedling stocks established in the field. For the subsequent supply-planting of failures the method described in the present communication can be recommended.

### Literature Cited

1. ANNUAL REPORT, *Rubber Research Institute of Malaya* (Botanical Division) p.60. 1931.
2. OSTENDORF, F. W., *De Ontwikkeling van jonge Hevea Oculaties. De Bergcultures.* 5. p. 765. 1931.