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EFFECT OF THE ROOTSTOCK AND SCION ON BUD EMERGENCE OF *HEVEA* BUDGRAFTS

By

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SUMMARY

Rate of scion bud emergence in six Hevea *clones budgrafted on to four different rootstock families has been studied. There is a significant influence of the rootstock and scion on the time of bud emergence and a highly significant specific combining ability of rootstocks and scions to give rise to early emergence of buds.*

INTRODUCTION

Hevea is propagated in Sri Lanka mainly by the use of bare root budded stumps. Budded stumps are usually planted in the field with the onset of the rainy season. If the conditions are favourable after planting, the buds start emerging in about 3-4 weeks and the plants get established before the dry season sets in. Buds do not emerge uniformly on all stumps and some buds remain dormant even 3 months after planting. Therefore the time of bud emergence may be critical to the establishment of a plantation, particularly in years where the rainy season is of short duration.

It has been reported that the time of bud emergence is dependent on the type of bud used in grafting. Buds from axils of assimilatory leaves, "leaf buds", emerge earlier than "scale buds", from axils of scale leaves (Du Plessix *et al*, 1967; Samaranayake and Gunaratne, 1977); therefore, they conclude that even resupplying, after planting, could be reduced if "leaf buds" are used in budgrafting (Samaranayake & Gunaratne, 1977).

We are budgrafting selected clones on to a number of different seedling families and this study was made to find out whether the time of bud emergence varies with the different clones and what effect the rootstock family has on the time of bud emergence.

MATERIALS AND METHODS

These data were collected from a field experiment laid down on Boralu series soils (Silva, 1968) on an estate in the Kalutara District. The experiment has been laid down to study rootstock/scion relationships of four rootstock families *viz* RRIC 52, 94 and 100 and PB 86 and six scion clones *viz* RRIC 13, 48, 52, 94 and 100 and PB 86. All possible stock/scion combinations of the clones used are planted in four randomised blocks with 14 plants per plot, in this experiment.

The number of buds sprouting at weekly intervals up to the twelfth week from planting was recorded. A bud was considered to have sprouted when it had burst through the scales and turned green.

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RESULTS

General pattern of scion emergence

The rate of emergence of buds of this whole group of stock/scion combinations can be considered to be the general pattern of bud emergence in *Hevea* grafts under the given environmental conditions (Fig. 1).

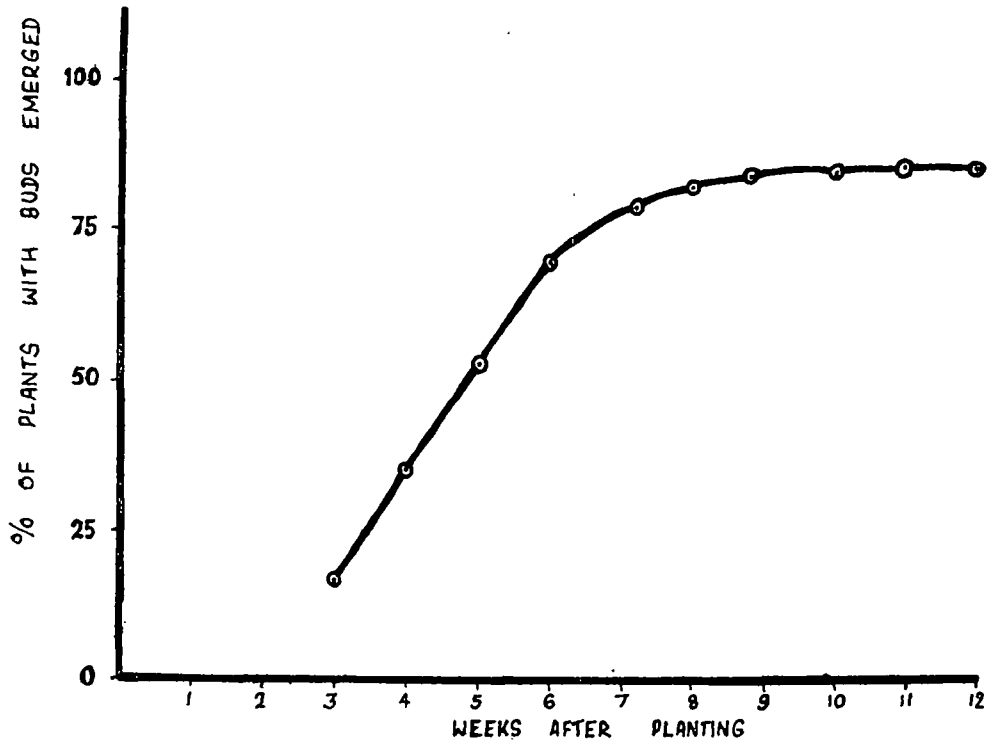

FIG 1. GENERAL PATTERN OF BUD EMERGENCE IN BUDDED STUMPS OF HEVEA

The pattern of bud emergence is clearly sigmoid, the rate of emergence is slow until the third week, then accelerated until the sixth week and decreased thereafter. The distribution of bud emergence is positively skewed indicating that the time taken for the second 50% of the buds to emerge was very much longer than for the first 50%, consequently it would be incorrect to compare the early bud emergence character using the mean period for bud emergence as the criterion. Therefore, it was decided to use the period taken for 25, 50 and 75 per cent of the buds to emerge as the basis of comparison.

An assessment based on these criteria would help to identify four distinct types of clones in respect of bud emergence, as follows:

(1) Those that commence bud emergence early and complete the process early.

(2) Those that commence early and complete late.

(3) Those that commence late and complete early.

(4) Those that commence late and complete late.

Influence of the rootstock.

The percentage emergence of buds on different rootstocks, irrespective of the scion is given in Table 1. The time of bud emergence is significantly affected by the rootstock.

TABLE 1. PERCENTAGE OF BUD EMERGENCE ON DIFFERENT ROOTSTOCK

Rootstock	*Percentage emergence*			
	3rd week	*4th week*	*5th week*	*6th week*
RRIC 94	21	37	62	77
RRIC 52	13	24	49	71
PB 86	10	27	57	74
RRIC 100	10	26	50	65
X^2 value	20.04***	11.65**	6.87*	6.84*

When classified according to the pattern of emergence (Table 2), buds on RRIC 94 rootstocks fall into type 1, they start emerging early and complete emergence early. Bud emergence on RRIC 52 rootstocks commences late but completion of emergence is intermediate between PB 86 and RRIC 94. Though the commencement of emergence on PB 86 rootstocks is rather late, it is compensated for by the emergence phase finishing early. On the other hand, on RRIC 100 rootstocks, the commencement and completion of emergence are late.

TABLE 2. GROUPING OF ROOTSTOCKS ACCORDING TO BUD EMERGENCE

Rootstock	*Period taken for emergence*			*Emergence phase*
	25%	50%	75%	*commencement — completion*
RRIC 94	22	31	41	early — early
RRIC 52	28	35	45	late — average
PB 86	27	33	42	late — early
RRIC 100	27	35	57	late — late

Influence of the scion

There are significant differences among the scions in the rate of emergence irrespective of the rootstock (Table 3).

TABLE 3. PERCENTAGE EMERGENCE OF BUDS OF DIFFERENT CLONES

Scion clone	*3rd week*	*4th week*	*5th week*	*6th week*
RRIC 48	24	39	63	75
PB 86	17	33	62	79
RRIC 52	15	29	52	69
RRIC 100	14	34	62	75
RRIC 94	10	24	54	72
RRIC 13	2	11	34	61
X^2	43.33***	39.75***	25.16***	5.82

In clone RRIC 48, 24% of the buds had emerged at the end of the third week whereas in RRIC 13 only 2% had emerged. Emergence of buds in the other four clones is intermediate between these two clones.

When the scion clones are grouped according to the pattern of bud emergence they fall into different groups as shown in Table 4.

TABLE 4. GROUPING OF SCION CLONES ACCORDING TO THE PATTERN OF BUD EMERGENCE

	Period taken for emergence in days			*Emergence phase*	
Scion clone	*25%*	*50%*	*75%*	*commencement*	— *completion*
RRIC 48	21	31	42	early	— early
PB 86	24	32	40	early	— early
RRIC 52	26	34	50	late	— late
RRIC 100	24	32	42	early	— early
RRIC 94	28	34	44	late	— average
RRIC 13	32	39	49	late	— late

In clones RRIC 48, PB 86, RRIC 100, bud emergence commences early and finishes early, in RRIC 52 and RRIC 13 both commencement of bud emergence and its completion are late and in RRIC 94 though the commencement is late completion of emergence is faster than in clones RRIC 52 and RRIC 13.

Rootstock/scion interaction

The number of buds that emerged in each combination four weeks after planting is given in Table 5. This shows that the specific combining ability of rootstocks and scion to give rise to early emergence of buds is highly significant.

TABLE 5. NUMBER OF BUDS THAT EMERGED AFTER 4 WEEKS FROM PLANTING

	Scion						
	No. of buds emerged						
Rootstock	*RRIC 48*	*PB 86*	*RRIC 52*	*RRIC 100*	*RRIC 94*	*RRIC 13*	*Total*
RRIC 94	28	23	12	31	25	4	123
RRIC 52	10	25	16	15	6	8	80
PB 86	29	19	15	17	8	3	91
RRIC 100	21	7	21	13	15	9	86
Total	88	74	64	76	54	24	380

$X^2 = 43.90^{***}$

Buds of RRIC 48 emerge early on all rootstocks except on RRIC 52. Clone PB 86 combines well with all rootstocks except RRIC 100 and RRIC 100 scions combine more readily with RRIC 94 than with others. Clone RRIC 52 does not show any specificity for rootstocks in this experiment. Emergence of RRIC 94 buds is good on its own rootstock but poor on others. RRIC 13 does not show any specificity and bud emergence is relatively poor on all rootstocks.

Discussion

Clones have been grouped into four types based on the pattern of emergence of the buds on grafting. Bud emergence depends on the scion, the rootstock and combination of the rootstock and scion. The pattern of bud emergence is important in that certain clones have the ability to emerge early and get established before unfavourable weather sets in. This pattern could be influenced by the rootstock family. Clone RRIC 48 emerges early when compared with a clone such as RRIC 13, when this Clone is grafted onto RRIC 52 rootstocks the emergence is delayed. Clones where the buds take a shorter time to commence and finish the bud emergence phase may show a lower variability in growth, when compared with those that take a longer period between commencement and completion of bud emergence. Other things being equal it would be advantageous to plant fast sprouting stock/scion combinations.

It has been reported that the variability in growth of certain clones is more than in others (Combe, 1975). Among other factors responsible for this d fference in variability, the difference in the rate of bud emergence may also be involved. However in an experiment where the performance of "Leaf buds" & "Scale buds" was studied, it was observed that, though there is a difference in the time of emergence of buds and in early growth of the scions, the difference in growth evened out later (Samaranayake and Gunaratne, 1977). Therefore, further observations will have to be made to see whether the variability in growth is in anyway related to the difference in bud emergence. With clones of the type where the bud emergence is late it would be interesting to find out whether the treatment with growth regulators could help in inducing early and uniform emergence of buds.

REFERENCES

COMBE, J. C. (1975). Mise en' evidence de la variabilite' intraclonale sur de jeuner greffes. *R.G.C.P.*, 52, 91—94.

DU PLESSIX, C. J., GENER, P. AND COMBE, J. C. (1971). Contribution de l' IRCA a' l' amelioration de la multiplication vegetative de l' *Hevea R.G.C.P.*, 45, 535—538.

SAMARANAYAKE CHANDRA AND GUNARATNE, R.B., (1977) The use of "Leaf buds" and "Scale buds" in the vegetative propagation of Hevea. *Jl. Rubb. Res. Inst. Sri Lanka*, 54, 65—69.

SILVA, C.G., (1968). Provisional classification of Rubber Soils of Ceylon and their relationship to Malayan soils. *Jl. Rubb. Res. Inst. Malaya*, 21 217—224.