

FACTORS AFFECTING SHOOT PRODUCTION IN TEA (*CAMELLIA SINENSIS*) WHEN GROWN AS A PLANTATION CROP

IV. INTER-CLONAL VARIATIONS IN THE EFFECTS OF APICAL DOMINANCE

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Introduction.—Apical dominance, or the inhibitory influence exerted by the terminal bud upon the axillary buds of a shoot, is a factor which appears to have received no previous attention in connection with shoot production in tea. This is somewhat surprising when it is remembered that one of the primary objects of correct bush management on a plantation is to secure the maximum production of new sympodically developed crop shoots.

Although plucking, which consists in removing the terminal bud and one or more of the topmost leaves of the shoot (Portsmouth and Rajiah 1957), is an operation which temporarily destroys apical dominance, there are many occasions when the readiness with which lateral buds develop into new shoots can profoundly affect future crop shoot production and yield potential.

As soon as experience with the large scale propagation of tea clones by means of nodal cuttings began to accumulate it was apparent that marked differences existed in the numbers of lateral branches produced by different clones at the same stage of main stem development. Poorly branching clones invariably proved to be poor yielders and failure to branch freely at the nursery stage was early accepted as a sufficient reason for discarding a selection (Kehl, 1950). Many of the highest yielding Tea Research Institute selections are actually so freely branching as to require no frame forming treatment whatsoever before the young bushes can be cut across and brought into plucking for the first time.

Following a prune, the new primary shoots are allowed to develop unchecked for several months before they are broken back to a level, approximately two mature leaves above the pruning level, to form a plucking table. Here again the density and subsequent yielding capacity of the plucking surface is obviously dependant on the degree to which the primary shoots have been able to develop lateral branches prior to the breaking back operation.

Finally, apical dominance effects may well play a major part in determining whether only one new shoot or several new ones are developed to replace each plucked shoot.

Tubbs (1935) recorded separately the yields of one thousand bushes on St. Coombs, over a total of five pluckings, and found a ten-fold range of variation in individual bush yields. Whilst much of this variation is obviously due to external causes, there must undoubtedly remain a large range of yield variation between bushes which is solely due to differences in internal factors. More recent work, which is still in progress, using lines of clonal tea grown under much more rigorously controlled conditions, has shown that there is almost as wide a range of variation in

the yields per unit area of plucking surface of the different clones included in the experiment. These later results strongly confirm the contention that much of the observed variation in yield found by Tubbs is due to internal factors.

On the basis of the considerations outlined above it, therefore, seemed reasonable to suppose that apical dominance might be one of the internal factors concerned in shoot production in tea and of sufficient importance to warrant investigation.

It is now well known that the terminal bud exerts its inhibitory effect on the axillary buds of the precedent nodes by producing one or more hormones which move downwards in the tissues of the shoot. Two lines of approach can, therefore, be adopted in investigating this phenomenon, either direct assay of the hormone production of the terminal buds themselves or observations of the extent of their inhibitory effects on lateral shoot development under controlled experimental conditions.

As no facilities for hormone assay existed at this Institute the latter method was of necessity adopted in the investigation now reported.

Materials and Methods.—When ready for plucking a flush shoot may be expected to comprise two scales, 1 fish leaf and 3 foliage leaves, making a total of 6 fully differentiated nodes. With such low node numbers available it appeared most unlikely that ordinary crop shoot material would permit of any valid assessments of the strength of apical dominance to be carried out. Work with such material was, therefore, temporarily abandoned during the present investigation and attention directed to the strongly growing primary shoots which are developed by the bush after a normal prune. Unless broken back to form a plucking table during the operation of "tipping" these primary shoots will continue in monopodial growth almost indefinitely, so that shoots comprising any required number of nodes are readily obtainable.

A small group of five adjoining well grown bushes, all originally planted out early in 1938, was selected for experimental purposes. The group contained one bush each of T.R.I. clones Nos. 2026, 2025, 2024, 2022 and 2011. These clones had all given very different yields in field trials and thus represented material in which it appeared possible that there might be considerable variations in apical dominance effects.

The bushes were all pruned down to the same level on 26-1-53 and the new primary shoots allowed to continue growing unchecked until an average of approximately 20 nodes per shoot had been produced. This condition appeared to be satisfied by 7-8-53, when observations were accordingly started.

Now, as briefly explained in the general introduction to this series of papers (Portsmouth 1957a), the cultural treatment meted out to tea is designed to produce a comparatively low growing type of bush with a wide expanse of level plucking surface. This peculiar frame formation undoubtedly influences the growth of the primary shoots produced after pruning, with the consequence that the centrally situated shoots develop more strongly and have longer internodes than those situated around the periphery of the bush. It is, of course, impossible to lay down any definite dividing line between these two types of shoots, but for convenience shoots selected near the centre of the bush (*central shoots*) will be treated separately from those selected towards the periphery (*side shoots*).

For each set of observations 20 central and 20 side shoots were selected at random on each bush. Three sets of observations were made in all on 7-8-53, on 28-9-53 and finally on 8-10-53.

Between the first and second set of observations the terminal bud and node below, bearing the latest unfolded leaf, was removed from all shoots on 15-8-53. The interval of 8 days between this operation and the first observation corresponded to the approximate time taken for one new foliage leaf to unfold at this time of year (Portsmouth and Rajiah 1957) and was thus equivalent to removing the terminal bud only at the time of the first observations. This operation was, however, deferred until the adequacy of the data collected had been assessed.

For the third set of observations the selected shoots were cut and brought into the laboratory for lateral shoots growth to be recorded. This procedure was necessary as it was found that the increase in the extent of lateral shoot development was so great as to render accurate recording impossible under field conditions at the time of the second observations.

Results.—(i) **PRIMARY SHOOT GROWTH.**—Data indicating the extent of the monopodial primary shoot growth, which had been developed by the date of the first observations, is presented in Table 1.

In the course of these observations the type of leaf borne by each main stem node was recorded. A succession of one or more scales followed by a fish leaf thus clearly indicated the existence of a *banji* period, during which the terminal bud had temporarily ceased to unfold and had assumed an outward appearance of dormancy. Having fixed this point the extent of the last period of uninterrupted growth was easily determined, the data being given in columns (7) and (8) of the table.

In passing it may be noted that it was not always possible to determine accurately the point of origin of some of the central shoots. The total number of nodes produced by these shoots was accordingly slightly indeterminate. This is indicated in the table.

The marked differences shown in the growth of the central and side shoots, together with the greater frequency with which the latter had gone *banji*, clearly confirmed the desirability of treating each group separately.

(ii) **AXILLIARY BUD DEVELOPMENT.**—The extent of axillary bud development at the time of the first observations is shown in Table 2. The relevant standard errors are also included where applicable in both this and subsequent tables.

The explanations of the various terms used are:—

Node numbering. All primary shoot (main axis) nodes were numbered successively from the apex downwards, the node bearing the youngest leaf which was completely free of the terminal bud being designated Node No. 1.

Active buds. All axillary buds which had at any time been in active growth were included in this category. Many of these buds had, of course, already developed into lateral branches at the time of observation. Axillary buds, which had never broken their initial state of dormancy (dormant buds) or which were only just starting to break their initial dormancy (breaking buds), were not included.

Active shoots. Any shoot bearing one or more active buds was considered an active shoot.

Active zone. The expression active zone has been used in connection with any group of successive primary shoot nodes in which almost all the axillary buds were either in active growth or breaking. In no case was such a zone allowed to be interrupted by more than one damaged or dormant bud. The zone was, of course, terminated at each end by active buds.

Table 1. Primary shoot growth at 7-8-53.

Clone No.	Type of shoot	Percentage showing banji periods	Average number of times banji		Total nodes	Average number of nodes in last growth period	
			Shoots with banji period	All shoots		Shoots with banji period	All shoots
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2026	Central Side	55 100	1.00 2.50	0.55 2.50	> 21.05 18.40	> 17.00 7.10	> 18.15 7.10
2025	Central Side	60 100	1.58 2.15	0.95 2.15	> 22.50 19.45	> 9.58 8.25	> 13.75 8.25
2024	Central Side	50 85	1.40 1.59	0.70 1.35	> 22.05 20.30	> 16.80 10.47	> 18.40 11.85
2022	Central Side	20 85	1.00 1.76	0.20 1.50	> 22.05 20.90	> 19.00 11.35	> 19.60 12.65
2011	Central Side	70 100	1.14 2.10	0.80 2.10	> 18.75 17.75	> 16.43 8.65	> 17.40 8.65
Mean	Central Side	51 94	1.22 2.02	0.64 1.92	> 21.28 19.16	> 21.28 9.16	> 17.46 9.70

Table 2. Axillary bud development before removal of terminal buds. From observations made on 7. 8. 53.

Clone No. (1)	Percent active shoots (2)	Total active buds per active shoot (3)	PARAMETERS OF LAST ACTIVE ZONE					
			Youngest active bud. Node No. (4)	Oldest active bud. Node No. (5)	Centre of zone. Node No. (6)	Extent of zone. Nodes (7)	No. of active buds (8)	Percentage activity of zone (9)
<i>CENTRAL SHOOTS</i>								
2026	50	5.00±0.87	8.60±0.67	13.20±0.84	10.90	5.60±0.95	5.00±0.87	89
2025	100	5.00±0.54	9.10±0.57	13.65±0.70	11.38	5.55±0.64	4.65±0.58	54
2024	100	7.55±0.69	6.95±0.25	13.50±0.79	10.23	7.55±0.74	7.45±0.73	99
2022	75	5.73±0.80	9.53±0.55	14.80±0.74	12.17	6.27±1.01	5.73±0.80	91
2011	25	2.80±0.80	8.80±2.35	10.40±2.23	9.60	2.60±0.93	2.40±0.75	92
<i>SIDE SHOOTS</i>								
2026	95	4.58±0.54	8.95±0.60	11.42±0.65	10.19	3.47±0.48	3.16±0.38	91
2025	100	5.25±0.75	7.70±0.64	10.90±0.77	9.30	4.20±0.78	3.35±0.48	80
2024	100	5.80±0.53	7.15±0.40	12.55±0.94	9.85	6.40±0.74	5.40±0.59	84
2022	90	5.22±0.58	8.50±0.59	12.28±0.67	10.39	4.78±0.64	4.11±0.53	86
2011	40	3.37±1.18	12.88±1.36	15.25±1.16	14.07	3.37±1.18	3.25±1.13	96

Table 3. *Axillary bud development after removal of terminal buds. From observations made on 28. 9. 53.*

Clone No.	Percent active shoots (2)	Total active buds per active shoot (3)	PARAMETERS OF LAST ACTIVE ZONE					
			Youngest active bud. Node No. (4)	Oldest active bud. Node No. (5)	Centre of zone. Node No. (6)	Extent of zone. Nodes (7)	No. of active buds (8)	Percentage activity of zone (9)
<i>CENTRAL SHOOTS</i>								
2026	95	Not recorded	*1.42±0.23	*9.53±0.83	5.48	9.11±0.76	8.37±0.72	92
2025	100	„	1.25±0.16	13.00±1.21	7.13	12.75±1.22	11.00±1.09	86
2024	100	„	1.00±0.00	13.20±1.21	7.10	13.20±1.21	12.55±1.20	95
2022	100	„	1.00±0.00	13.95±1.11	7.48	13.95±1.11	13.15±1.00	94
2011	85	„	*2.06±0.47	*7.29±0.93	4.68	6.24±0.93	6.18±0.93	99
<i>SIDE SHOOTS</i>								
2026	90	„	*2.28±0.59	*5.17±0.79	3.73	3.89±0.73	3.39±0.61	87
2025	100	„	1.85±0.48	9.85±1.14	5.85	9.00±1.04	7.75±0.77	86
2024	100	„	2.50±0.60	12.00±1.16	7.25	10.50±1.06	9.10±0.93	87
2022	100	„	3.05±0.65	13.30±0.61	8.18	11.25±1.14	9.55±1.02	85
2011	40	„	*3.50±1.45	*9.25±1.62	6.38	6.75±1.67	6.13±1.64	91

*New active zone developed after treatment.

Table 4. Changes in axillary bud development.

Clone No.	Percent increase in active shoots	CHANGES IN PARAMETERS OF LAST ACTIVE ZONE						
		Youngest active bud. Nodes	Oldest active bud. Nodes	Centre of zone. Nodes	Extent of zone. Nodes	Percent increase in extent	No. of active buds	Percent increase in No.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>CENTRAL SHOOTS</i>								
2026	+ 90	* - 7.18 ± 0.71	* - 3.67 ± 1.18	- 5.42	+ 3.51 ± 1.21	+ 63	+ 3.37 ± 1.13	+ 67
2025	Nil	- 7.85 ± 0.59	- 0.65 ± 1.40	- 4.25	+ 7.20 ± 1.38	+ 130	+ 6.35 ± 1.23	+ 137
2024	Nil	- 5.95 ± 0.25	- 0.30 ± 1.45	- 3.13	+ 5.65 ± 1.42	+ 75	+ 5.10 ± 1.41	+ 68
2022	+ 33	- 8.53 ± 0.55	- 0.85 ± 1.33	- 4.69	+ 7.68 ± 1.50	+ 122	+ 7.42 ± 1.28	+ 129
2011	+ 240	* - 6.74 ± 2.40	* - 3.11 ± 2.42	- 4.92	+ 3.64 ± 1.31	+ 140	+ 3.78 ± 1.20	+ 158
<i>SIDE SHOOTS</i>								
2026	- 5	* - 6.67 ± 0.84	* - 6.25 ± 1.02	- 6.46	+ 0.42 ± 0.87	+ 12	+ 0.23 ± 0.72	+ 7
2025	Nil	- 5.85 ± 0.80	- 1.05 ± 1.37	- 3.45	+ 4.80 ± 1.30	+ 114	- 4.40 ± 0.91	+ 131
2024	Nil	- 4.65 ± 0.72	- 0.55 ± 1.50	- 2.60	+ 4.10 ± 1.29	+ 64	+ 3.70 ± 1.10	+ 69
2022	+ 11	- 5.45 ± 0.88	+ 1.02 ± 0.91	- 2.21	+ 6.47 ± 1.31	+ 135	+ 5.44 ± 1.15	+ 132
2011	Nil	* - 9.38 ± 1.99	* - 6.00 ± 2.00	- 7.69	+ 3.38 ± 2.04	+ 100	- 2.88 ± 1.99	+ 89

* New active zone developed after treatment.

Table 5. Lateral branch development. From observations made on 7. 8. 53 and 8. 10. 53.

Clone No. (1)	No. of primary shoot nodes compared (2)	Mean No. of Lateral branch nodes developed at each Primary shoot node		Increase (5)	Percentage increase (6)
		Before removal of terminal buds (3)	After removal of terminal buds (4)		
<i>CENTRAL SHOOTS</i>					
2026	15	0.51 ± 0.14	3.05 ± 0.36	+ 2.54 ± 0.39	+ 498
2025	20	0.89 ± 0.15	4.68 ± 0.26	+ 3.79 ± 0.30	+ 426
2024	17	1.67 ± 0.31	4.08 ± 0.33	+ 2.41 ± 0.45	+ 144
2022	16	1.28 ± 0.34	6.34 ± 0.45	+ 5.06 ± 0.56	+ 395
2011	14	0.14 ± 0.04	1.53 ± 0.23	+ 1.39 ± 0.31	+ 993
<i>SIDE SHOOTS</i>					
2026	14	0.80 ± 0.25	1.44 ± 0.17	+ 0.64 ± 0.30	+ 80
2025	13	0.85 ± 0.18	3.20 ± 0.22	+ 2.35 ± 0.29	+ 276
2024	14	1.07 ± 0.25	3.03 ± 0.14	+ 1.96 ± 0.28	+ 183
2022	17	0.91 ± 0.16	2.29 ± 0.11	+ 1.38 ± 0.20	+ 152
2011	13	0.14 ± 0.06	0.78 ± 0.13	+ 0.64 ± 0.14	+ 457

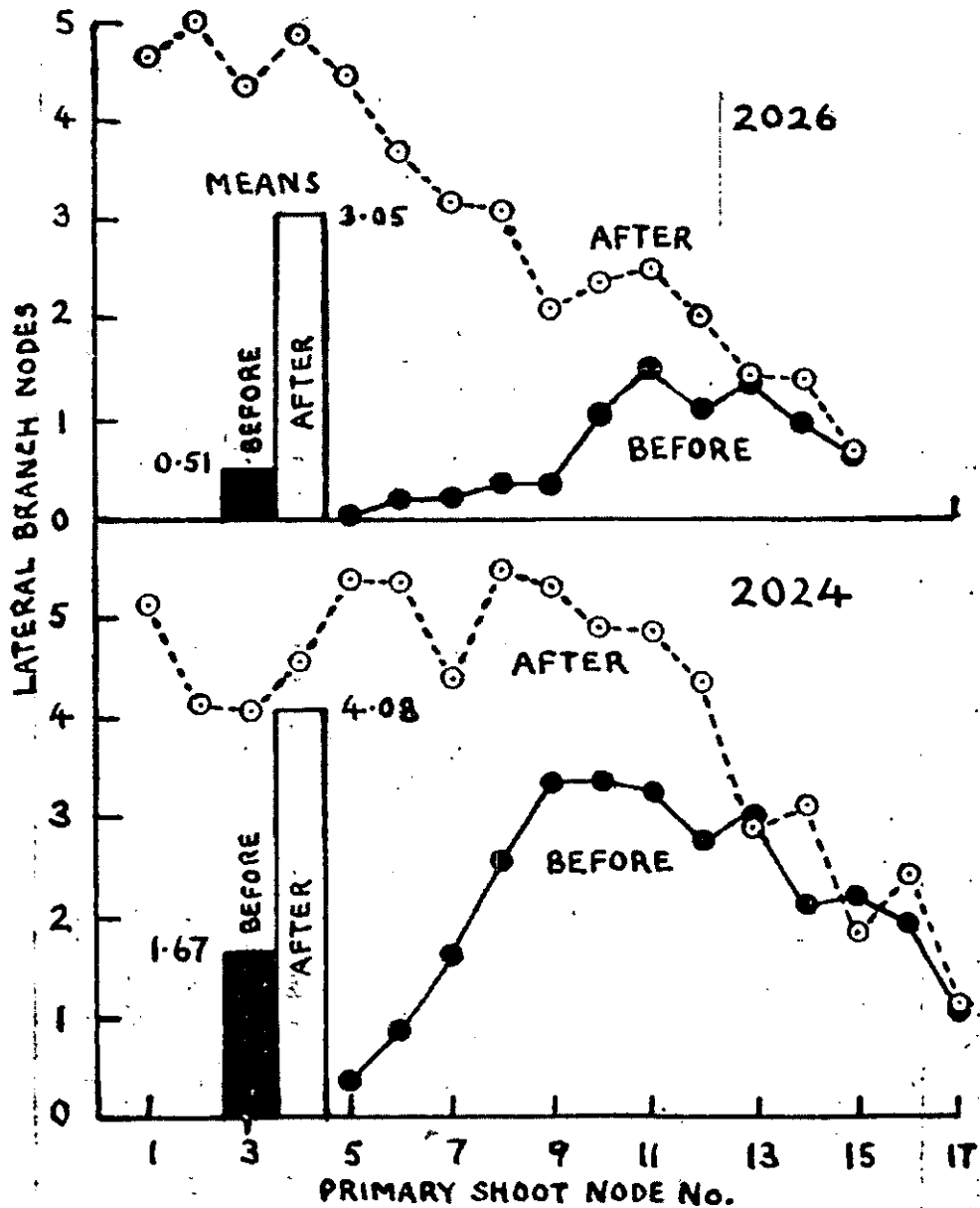


Figure 1. Diagram showing the extent of lateral branch development of the central shoots of clones Nos: 2024 and 2026, both before and after terminal bud removal. The data have been reduced to a single shoot basis.

The last active zone, for which parameters are given in the tables, was thus the zone of continuous axillary bud activity closest to the apex.

From Table 2 it is obvious that, under conditions of unrestricted monopodial growth, marked and significant differences existed between the various clones, both in respect of the proportions of shoots exhibiting axillary bud activity and in respect of the position and extent of such activity.

The removal of the terminal buds on 15-8-53 greatly stimulated axillary bud activity, as is evident from the data, recorded at the time of the second observations, presented in Table 3.

In the case of the less active clones, Nos. 2026, 2022, and 2011, the proportions of active shoots in the samples show a general increase, whilst the extent and closeness to the apex of the last active zone has greatly increased in all cases. In clones Nos. 2025, 2024 and 2022 these latter effects were obviously the result of an extension of the old last active zone, but in clones Nos. 2026 and 2011 an entirely new active zone appears to have been developed in closer proximity to the apex.

The extent of the changes which occurred in the various parameters recorded are shown in Table 4.

Considering these results in detail it will be seen first that all the changes produced in the positions of the youngest active bud, given in column (3) of the table, are obviously highly significant. Furthermore it is probably not unreasonable to suggest that the relative magnitudes of these particular changes provide a good measure of the relative strengths of apical dominance effects in the different clones. This is a point which will be considered further in the discussion.

The changes recorded in columns (6) and (8) of the table are also all highly significant except in the case of clones Nos. 2026 and 2011. This result was to be expected in view of the fact that, as stated previously, these two clones had apparently developed entirely new active zones.

Further confirmation of this presumed development of new active zones is afforded by the data recorded in column (4), since the only significant changes in the position of the oldest active bud are those shown by clones Nos. 2026 and 2011.

(iii) LATERAL BRANCH DEVELOPMENT.—Some idea of the changes in lateral branch development induced by terminal bud removal can be obtained from Figure 1, in which data for the central shoots of a good clone No. 2024, and a poor clone, No. 2026, are shown diagrammatically. The means given on the diagram cover the whole range of primary shoot nodes used for comparison purposes and are the same as those given in columns (3) and (4) of Table 5, in which lateral branch development data for all the different clones is summarized.

As figures for all the 20 shoots in each sample have been utilised, the range of primary shoot-nodes, from node No. 1 downwards, which has been used for comparison purposes varies somewhat from clone to clone, since it was of necessity restricted to the maximal number of nodes common to every shoot in each pair of samples. Details of these ranges are given in column (2) of the table.

Finally it may be noted that the increases in lateral branch development following terminal bud removal, shown in column (5) of the table, are all obviously highly significant.

Discussion and Conclusions.—Before considering the implications of the results reported in the previous section a knowledge of the relative yields of the five clones used is necessary. Calculated yields expressed as pounds made tea per acre, secured during the first three years of plucking, from test lines growing under identical conditions, are accordingly presented in Table 6.

Table 6. *Clonal Yields.*

Clone No. (1)	Calculated Yields as lbs/acre made tea				
	1st year (2)	2nd year (3)	3rd year (4)	Average (5)	Order of merit (6)
2026	380	1120	1780	1093	4
2025	745	1830	2310	1628	2
2024	1240	2295	2655	2063	1
2022	860	1650	1535	1348	3
2011	460	925	1285	890	5

Based on yield alone the order of merit of these clones is Nos. 2024, 2025, 2022, 2026 and 2011; an order which is clearly strongly correlated with many of the parameters and changes recorded in the preceding tables.

Considering first the data of Table 2, strong indications of this order can be seen in:—

(1) The percentages of active shoots per sample. Combining the figures for central and side shoots in column (2) of the table gives No. 2024 = No. 2025 = 100%, No. 2022 = 82.5%, No. 2026 = 72.5% and No. 2011 = 32.5%, which is in complete agreement with the yield order.

(2) The total numbers of active buds per active shoot and per last active zone. In both cases clone No. 2024 shows the highest figures and clone No. 2011 the lowest.

(3) The nodal position of the youngest active bud. Here again clone No. 2024 shows the smallest node number and clone No. 2011 the highest.

All the above characteristics are ones which are presumably largely conditioned by apical dominance effects and the results thus provide strong support for the contention that apical dominance is a factor of considerable importance in shoot production.

However, the figures for the total numbers of active buds per bush, for the complete sample of 40 shoots, are probably of most interest in this connection, since this method of presentation combines both the numbers of active shoots and the numbers of active buds per shoot. These figures, both before and after the removal of the terminal buds, and their correlations with yields are accordingly given in Table 7.

Table 7. Clonal yields and numbers of active buds per sample of 40 shoots.

Clone No. (1)	Annual Yield lbs/acre (3 yr. average) (2)	Before removal of terminal buds		After removal of terminal buds
		Total of all active buds (3)	Total active buds in last zone (4)	Total active buds in last zone (5)
2026	1093	137	110	220
2025	1628	205	160	375
2024	2063	267	257	433
2022	1348	180	160	454
2011	890	41	38	154
Correlations with Yield		+ 0.9522*	+ 0.9636**	+ 0.7970

Significance levels where $n = 3$

	P	r
**	.01	0.9587
*	.02	0.9343
	.05	0.8783

Both sets of correlations of active bud number, calculated from the figures obtained before the removal of the terminal buds, are as highly significant as could be expected with such a small number of values. This fact, together with the fact, that the correlation obtained after the removal of the terminal buds is not significant is most interesting, since it suggests that the operation of plucking, equivalent to terminal bud removal, can have little or no influence on inherent yield.

Taking $r = + 0.9636$ from column (4) of Table 7, as being the more accurate of the two estimates of the correlation coefficient obtained before terminal bud removal, gives a regression of yield (y) on active bud number (x): $y = 601 + 5.54x$ lbs/acre/annum. Using the formula $SD_r = \sqrt{\frac{S(y-\bar{y})^2}{n-2}} \sqrt{1-r^2}$, as an estimate of

the standard deviation of the differences between actual and predicted values, gives $SD_r = 10.13\%$ of \bar{y} , indicating that potential yield can be predicted with an accuracy of about ± 10 per cent by this means.

If substantiated, this finding should prove of considerable importance, since it offers a means of making useful yield comparisons between clones without the necessity for maintaining continuous plucking records over several years. All that is required is to cut all the bushes across at the same time, allow the new primary shoots to develop unchecked for about 6 months, and then carry out the appropriate count of active buds on a sample of shoots from each bush.

The data for active bud number discussed above show that terminal bud removal has brought about a marked reduction in the recorded differences between clones. This can also be seen from Table 3, in which the differences between the various parameters recorded, for clones Nos. 2025, 2024 and 2022, in all columns are almost entirely non-significant. Clones Nos. 2026 and 2011 must, however, be excluded from the argument, since, as explained previously, terminal bud removal has brought about the development of new active zones.

In order for this greater uniformity of recorded parameters to have resulted from terminal bud removal it is necessary for the greatest changes to have occurred in the poorest clones and vice versa; *i.e.* the magnitudes of these changes should display an inverse relation with yield order. That this is indeed the case can be seen from Table 4, in which the relative order of change in almost all the parameters recorded is first clone No. 2022, then No. 2025 and finally No. 2024.

A somewhat similar inverse relationship is apparent in connection with the changes in lateral branch development recorded in Table 5. This is most readily perceived if the percentage increases in the mean numbers of lateral branch nodes, given in column (6) of the table, are studied.

All these inverse relationships strongly confirm the previously expressed contention that the operation of plucking, although it must temporarily destroy apical dominance, has little or no effect on the yield potential that can be realised by any particular clone. Yield potential would thus appear to be an inherent characteristic which is inversely correlated with the degree of apical dominance exerted by the terminal bud of an actively growing shoot, the strength of such apical dominance being measured by its effect on axillary bud development. Furthermore none of the cultural operations at present employed in bringing a bush into bearing appear capable of neutralising these apical dominance effects. The practice of discarding a poorly branching selection at the nursery stage would therefore appear to be fully justified.

Acknowledgement.—The invaluable co-operation of Messrs. F. H. Kehl and E. S. Rajiah is once again gratefully acknowledged.

Summary.—The results of observations on the amount of axillary bud development, both before and after terminal bud removal, shown by the primary shoots of five different T.R.I. clones which had been allowed to develop unchecked for over six months, are presented and discussed.

Prior to terminal bud removal, a highly significant correlation between the numbers of active axillary buds developed and the relative yields of the different clones has been shown to exist. The calculated regression of yield on active axillary bud number indicates that the adoption of a suitable sampling technique, involving counts of active buds, can be used to predict potential clonal yields with an accuracy of about ± 10 per cent.

It is suggested that this relationship owes its origin to the fact that the observed differences in clonal yield potential are largely inherent and are inversely proportional to the strengths of the apical dominance effects exerted by the terminal buds.

Following terminal bud removal there was a marked levelling up in the various parameters recorded and the correlations with yield disappeared. This suggests that neither the operation of plucking which, like terminal bud removal, must temporarily destroy apical dominance, nor any of the normal cultural operations can have much effect on inherent yield potential.

References

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