PLANT GROWTH AND YIELD IN THE CAVENDISH BANANA *(Musa cavendishii* Lamb.*)* AS AFFECTED BY SIZE AND TYPE OF PLANTING MATERIAL

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SUMMARY

The effect of size and type of planting material on plant growth and yield in the Cavendish banana has been investigated at the Maroochy Experiment Station using "bits" ranging from 1 lb to 6 lb in weight and "suckers" ranging from 10 in. to 20 in. in maximum girth.

Bits required a longer period to emerge than suckers but produced a uniform stand of plants which were taller, were greater in girth and bore larger bunches than plants grown from suckers. These differences were reflected in the greater number of hands per bunch and the greater number of fingers.

Size of planting material had no appreciable effect on the performance of bits, although plants from the larger sizes matured their bunches a little earlier than those from the smaller. The performance of sucker planting material, on the other hand, varied with size—the smaller the sucker the longer the growing period, the greater the number of leaves and, in general, the greater the bunch weight.

Neither size nor type of planting material had any influence on the total number of suckers produced.

Fruit filling was similar in all types of planting material tested.

From a commercial point of view, bits weighing 2–4 lb appear to be the best type of planting material. Where these are not available, "sword" suckers with a corm girth of 12 in. are preferable to either larger or smaller sizes.

I. INTRODUCTION

Little information is available regarding the relative merits of bits and suckers as planting material for the establishment of banana plantations. Opinions have often been expressed, but these are usually based on field observations in commercial plantings. Freeman (1938) discussed the use of butts, suckers and bits and considered that butts were to be preferred as planting material. On the other hand, Eastwood (1948) favoured suckers, and according to Malan (1949) this was the principal planting material used in South Africa in 1949. Mitchell

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(1950), Wills (1951) and Wills and Berrill (1953), however, considered bits to be superior. The results of field trials reported by the Jamaican Department of Agriculture (Anon. 1953) suggest that there is little difference between suckers and bits insofar as effects on time of maturity and yield of fruit are concerned. These trials were carried out on the Lacatan variety, which is not grown commercially in Australia, and the suckers were larger than those generally used here for the propagation of the Cavendish variety. The bit planting material was also of a different type.

As the type of planting material used to establish the crop may be important in commercial practice, a trial was laid down at the Maroochy Experiment Station, 70 miles north of Brisbane, to determine the performance of a range of sizes of bit and sucker planting material.

II. EXPERIMENTAL PROCEDURE

(a) Treatments and Layout

Bits 1 lb, 2 lb, 3 lb, 4 lb, 5 lb and 6 lb in weight were used. Except for the largest size, these bits were cut from corms of plants which had either just bunched or were close to bunching, and trimmed to a single outermost bud on the upper surface of the corm (the so-called "pink" eye) according to the method described by Wills and Berrill (1953). On account of their size, 6 lb bits were necessarily cut from corms of plants which had either bunched some time previously or from which the bunch had actually been harvested.

Suckers used were 10 in., 12 in., 14 in., 16 in., 18 in. and 20 in. in maximum corm circumference. They were selected for vigour, and had pseudostems tapering to spear points and carrying narrow sword leaves.

The experiment was laid out as a randomized block with five replications of 12 treatments and four plant plots; there were guard rows between blocks but not between plots in the individual blocks.

(b) Cultural Data

The Cavendish variety was used in the trial. The experimental area was planted on December 11, 1953, with a spacing of 9 ft × 9 ft between plants. Rows were established on the approximate contour, with inter-row surface drains. The Ducasses variety was close-planted on the northern and eastern boundaries as a windbreak.

The original soil pH was 5·1. Lime was applied at the rate of 1½ tons to the acre eight weeks before planting. According to the soil buffer curve this should have raised the pH to 5·5.

Standard fertilizer schedules were used, an 8:12:8 complete mixture being applied at the rate of 1½ lb per plant at shoot emergence, followed by two applications of the same mixture six weeks apart at the rate of 2 lb per plant. Bunches were propped as a protection against wind damage.

Suckers were removed as soon as they appeared above ground in order to minimize any effect of offshoot "parasitism" on bunch development in the plant crop from which yield data were to be recorded.

Weather conditions during the growing period were somewhat variable. The plants made excellent growth until early February 1954, but cyclonic winds about the middle of the month caused some leaf damage. Root injury was negligible, however, and normal growth was resumed soon after the temporary setback. In July of the same year, a second cyclone caused extensive leaf and root damage. Plant recovery was slow and growth did not return to normal until November 1954, when bunching was already in progress. Bunches were thrown between October 1954 and February 1955, but datum bunches were restricted to the December–February period. Harvesting commenced in January 1955 and was completed in July of the same year, all datum bunches being cut from April to June.

(c) Records

Growth data were recorded from all plants at monthly intervals up to the time of bunching. Times of sucker emergence were noted until two months after each bunch was harvested in order to determine the total sucker potential of the plant. All bunches were weighed at the time of harvest and the number of hands in the bunch and the number of fingers in each hand were counted. In addition, the distribution of fingers among the various market size grades was recorded.

III. RESULTS

(a) Plant Emergence

Planting was carried out on December 11, 1953, under favourable conditions and a good strike was obtained. Misses are recorded in Table 1.

TABLE 1

PERCENTAGE OF PLANTING MATERIAL FAILING TO SHOOT

Treatment No.	1	2	3	4	5	6	7	8	9	10	11	12
—	Bits (lb)						Suckers (in. girth)					
	1	2	3	4	5	6	10	12	14	16	18	20
Misses (%)	5	–	10	5	–	30	15	5	10	–	–	–
	Mean 8·3%						Mean 5·0%					

With the exception of the 6 lb bits, differences in strike were of no importance. Bits of this size, however, could only be obtained from plants which had already bunched for a considerable period (in some cases the bunch had actually been harvested), and it is possible that nutrient reserves in the corm were low when the bits were cut. Further work is planned to elucidate this point.

Examination of the unshot 6 lb bits some two months after planting indicated that little or no primary root development had occurred and the eye showed no signs of enlargement. Rotting appeared to be negligible.

(b) Time of Emergence

The recorded data for periods from planting to shoot emergence are presented in Table 2.

TABLE 2

PERIOD FROM PLANTING TO SHOOT EMERGENCE (DAYS)

Treatment No.	1	2	3	4	5	6	7	8	9	10	11	12
—	Bits (lb)						Suckers (in. girth)					
	1	2	3	4	5	6	10	12	14	16	18	20
No. of days (Mean) ..	27·3	24·9	33·6	27·5	27·8	30·4	28·7	21·7	21·7	23·6	20·8	21·4

Significant differences (1%)—Treatment No. 1>>11 ; 3>>2, 8, 9, 10, 11, 12 ; 5>>11, 12 ; 6>>8, 9, 11, 12 ; 7>>8, 11, 12.

Significant differences (1%)—Bits>>Suckers.

Significant differences (5%)—Regression co-efficient for suckers (linear) = − 1·08.

Bits required a significantly longer period to emerge after planting than did suckers. With the exception of those weighing 3 lb, bit size had no apparent effect on the period from planting to shoot emergence.

In suckers, 10 in. girth planting material required a much longer period to emerge than the 12–20 in. sizes. Small suckers are presumably still drawing nutrients from the parent plants when collected and the apparent setback which they suffer at planting may indicate inadequate food reserves in their corms. Since there were no differences in the times taken for the suckers ranging from 12 in. to 20 in. in girth to emerge, there appears to be some justification for regarding a 12 in. sucker as the minimum size for commercial plantings.

The regression co-efficient for suckers is significant only at the 5 per cent. level but the calculated relationship suggests that in general the period from planting to shoot emergence is slightly reduced when the larger sizes are used. No such relationship exists in the case of bits.

(c) Planting to Bunching

All datum bunches were thrown under good growing conditions over a period of six weeks from December 1954 to February 1955 and the rate of leaf

development was constant in all treatments. It therefore seems valid to use the recorded period from planting to bunching as an indication of the rate of plant development. The data are summarized in Table 3.

TABLE 3

PERIOD FROM PLANTING TO BUNCHING (DAYS)

Treatment No.	1	2	3	4	5	6	7	8	9	10	11	12
—	Bits (lb)						Suckers (in. girth)					
	1	2	3	4	5	6	10	12	14	16	18	20
No. of days (Mean) ..	399	387	396	386	380	372	418	394	396	386	366	354

Significant differences (1%)—Treatment No. 1>>6, 11, 12; 2, 4, 5, 10>>12; 3, 8, 9>>11, 12; 7>>2, 4, 5, 6, 10, 11, 12.

Significant differences (1%)—Regression co-efficient for bits (linear) = −4·89.

Regression co-efficient for suckers (linear) = −11·84.

It is evident from the regression co-efficients that for each 1 lb increase in weight of the bits used as planting material, the period from planting to bunching was reduced by some five days. Similarly, in the case of suckers, a 2 in. increment in the girth of the planting material reduced the period from planting to bunch emergence by some 12 days.

There is an obvious tendency for plants grown from large bits to throw their bunches early. The apparent discrepancy in the 3 lb bit data is due to the long period recorded between planting and shoot emergence. It would appear that the critical minimum weight for this type of planting material lies between 1 lb and 2 lb if maximum growth rate in the resulting plant is to be achieved.

The effect of size of planting material is more marked in the sucker than in the bit series of treatments. Plants grown from very small suckers (10 in. girth) were slow to throw their bunches, and conversely very large suckers (18–20 in. girth) passed through the vegetative phase quickly.

The average period from planting to bunching was almost 13 months in both bit and sucker planting material.

(d) Bunching to Harvesting

Periods from bunching to harvesting are recorded in Table 4.

TABLE 4

PERIOD FROM BUNCHING TO HARVESTING (DAYS)

Treatment No.	1	2	3	3	4	6	7	8	9	10	11	12
—	Bits (lb)						Suckers (in. girth)					
	1	2	3	4	5	6	10	12	14	16	18	20
No. of days (mean) ..	114	113	121	120	105	104	125	118	112	110	103	102

Significant differences (1%)—Treatment No. 3>>5, 6, 11, 12; 4, 8>>11, 12; 7>>5, 6, 10, 11, 12.

Significant differences (5%)—Regression co-efficient for bits (linear) = −2·21.

Significant differences (1%)—Regression co-efficient for suckers (linear) = −4·67.

Bunch development was more rapid in plants grown from 5 lb and 6 lb bits than in those grown from bits weighing from 1 lb to 4 lb. As all bunches matured under similar climatic conditions, it appears that the length of the period from bunching to harvesting, like the period from planting to bunching, may be linked in some way with the nutrient reserves available in the bit at the time of planting.

In the sucker series of plants, the rate of bunch development shows a close correlation with size of planting material, bunches on plants grown from 10 in. suckers requiring 23 days longer to fill than bunches on plants grown from 20 in. suckers. Each 2 in. increase in sucker size brought the harvest forward by about five days.

Bit size had less influence than sucker size on rate of bunch development in the types of planting material used. This probably explains the greater uniformity in bunch harvesting in the several plots established from bits as compared with those established from suckers.

(e) Plant Height and Girth

Height was measured as the length of the pseudostem from ground level to the throat of the plant where the bunch stem first becomes visible. Plant girth was construed as the maximum circumference of the pseudostem and was read about 1 in. above ground level. Data for the several treatments are summarized in Table 5.

TABLE 5

PLANT HEIGHT AND PLANT GIRTH

Treatment No.	1	2	3	4	5	6	7	8	9	10	11	12
	Bits (lb)						Suckers (in. girth)					
—	1	2	3	4	5	6	10	12	14	16	18	20
Height (in.)	65·4	65·5	63·6	66·3	67·3	67·7	60·9	64·4	61·6	62·8	63·0	59·7
Girth (in.)	27·7	27·8	26·6	27·6	27·8	27·9	26·0	27·1	26·2	26·2	26·0	25·2

Significant differences (1%) Height—Treatment No. 2, 4, 6>>12 ; 5>>7, 12.

Significant differences (1%)—Bits >>Suckers, for unweighted average heights.

Significant differences (1%)—Girth—Treatment No. 1, 2, 4, 5, 6>>12.

Significant differences (1%)—Bits>>Suckers, for unweighted average girth.

Plants grown from bits were taller than those grown from suckers, the mean difference of 3·9 in. being highly significant. Plants grown from bits were very uniform when compared with those grown from suckers. In the latter, a significant difference at the 5 per cent. level was recorded between Treatments 8 and 12, but the difference (4·7 in.) would be of no commercial importance.

There were no significant differences in girth between the plants grown from bits of various weights and those grown from suckers of various sizes. Mean girth measurement in bit plants, however, was significantly greater than that in sucker plants, the difference being 1·5 in.

Size of planting material, as opposed to type, had no apparent effect on either plant height or girth. It is, however, interesting to note that the height : girth ratio (2·3 : 1) was constant irrespective of the size or type of planting material used. This would suggest that there is probably always a definite ratio between height and girth in the Cavendish variety, but whether the value of 2·3 : 1 is constant under all environmental conditions has yet to be proved. Summerville (1944) obtained ratios ranging from 1·7 : 1 with small plants up to 2·0 : 1 with large plants, but these were all in the vegetative condition. In view of the progressive increase in the ratio with increasing plant size, it is very probable that a value approaching 2·3 might have been obtained if these plants had been measured at the time of bunching.

(f) Number of Leaves

The number of leaves recorded in this experiment included both juvenile (sword) leaves and those with normal adult characters.

The counts are summarized in Table 6.

TABLE 6

NUMBER OF LEAVES

Treatment No.	1	2	3	4	5	6	7	8	9	10	11	12
	Bits (lb)						Suckers (in. girth)					
—	1	2	3	4	5	6	10	12	14	16	18	20
No. of leaves	42·1	40·7	40·5	39·7	39·3	38·3	44·4	43·1	42·2	41·8	39·0	36·8

Significant differences (1%)—Treatment No. 1, 9>>4, 5, 6, 11, 12; 2, 3, 4, 5, 11>>12; 7>>2, 3, 4, 5, 6, 10, 11, 12; 8>>2, 3, 4, 5, 6, 11, 12; 10>>5, 6, 11, 12.

Significant differences (1%)—Regression co-efficient for bit size (linear) = −0·68.

Regression co-efficient for sucker size (linear) = −1·45.

In both bit and sucker series of plants, there was an inverse relationship between number of leaves and size of planting material: the larger the planting material, the smaller the number of leaves produced by the plant. In the bit series of plants, the difference between maximum and minimum numbers of leaves was 4; in the sucker series it was 7. Thus, for every 1 lb increase above the minimum weight (1 lb) of the bits used, leaf number was reduced by 0·68. Similarly, for every 2 in. increase in sucker girth above the minimum used (10 in.), leaf number was reduced by 1·45.

Variations in leaf number would appear to be correlated with the vigour of the plant, as trends in the data for leaf numbers and periods from planting to bunching are much the same. Summerville (1944) showed that, provided the

supply of plant nutrients is not the limiting factor, the rate of leaf production is mainly dependent on the prevailing temperature and soil moisture conditions. A plant which required a longer period to reach the bunching stage would therefore be expected to produce a greater number of leaves. The present results appear to confirm this. The recorded differences in leaf number are derived primarily from adult leaves; the number of juvenile leaves was more or less constant (an average of 4 for bits and 3·5 for suckers). Leaf production in plants adequately supplied with nutrients (as in this trial) averaged 4 sword-leaves and 36–37 adult leaves.

The absence of any correlation between girth of the plant and leaf number suggests that the growth rate of the plant may also be important in girth development. In a vigorously growing plant the external leaf bases are probably forced outwards by the expansion of the pseudostem to a greater extent than in a plant which is growing less rapidly. This would obviously increase the girth measurement in the more vigorous plant. It should also be noted that as plant heights were not significantly different and numbers of leaves were, the greater the number of leaves the less the distance to which they were extruded. This distance is therefore a useful criterion of plant vigour.

(g) Number of Suckers

All suckers were removed as soon as they appeared above the ground in order to eliminate possible effects of offshoot parasitism on bunch size in the parent plant. Records are therefore available of the number of suckers produced and their dates of emergence. Data on the total number of suckers produced are summarized in Table 7.

TABLE 7

NUMBER OF SUCKERS

Treatment No.	1	2	3	4	5	6	7	8	9	10	11	12
—	Bits (lb)						Suckers (in. girth)					
	1	2	3	4	5	6	10	12	14	16	18	20
No. of suckers	18·0	17·7	18·3	16·8	16·6	16·6	17·6	17·0	17·1	17·6	16·2	19·5

Significant differences—Nil.

The type and size of planting material had no effect on the total number of suckers produced. This would be expected in the case of bits, for each plant is the product of a single eye which develops into a new corm. These should logically have similar sucker potentials. The uniformity of sucker production in plants grown from suckers, however, would suggest that these must have also formed new corms after planting; secondary corm formation in suckers is common in southern Queensland. Additional support for this suggestion comes from a consideration of the number of leaves produced by the plants grown

from 20 in. suckers and the period from planting to bunching. From the data presented by Summerville (1944) it is fairly certain that bunch initiation had already commenced in these large suckers before they were planted. If development had continued from the original growing point, only a relatively small number of leaves would have been produced before the bunch was thrown. Actually, however, these plants did not bunch until 354 days after planting (see Table 3) and produced 36·8 leaves (see Table 6), so it would appear that a new corm was formed.

The removal of suckers as they appeared would have the effect of stimulating development in the remaining sucker buds, and it is assumed that most, although probably not all, of the buds on the exposed sides of each corm were forced into growth. Such buds are, of course, quite distinct from buds situated between leaf bases on the upper surface of the corm which normally remain dormant under field conditions. The latter are used in preparing bits for planting.

The total number of suckers produced by each plant was approximately 17. Of these, an average of 13 appeared above ground prior to bunching, 2 between bunching and harvesting and 2 after the bunch had been cut. It follows, therefore, that where practicable the follower for the ratoon crop should always be set before the bunch is thrown by the parent plant. If setting is delayed beyond this stage, the chance of a suitable follower being available in the right position becomes increasingly remote and the suckers themselves may be lacking in vigour.

(h) Number of Hands and Bunch Weight

All bunches were harvested in the mature-green stage, the fruit being weighed (after removal from the stalk) and the numbers of hands and the numbers of fingers per hand recorded. Data for bunch size and net fruit weight are summarized in Table 8.

TABLE 8

NUMBER OF HANDS AND NET BUNCH WEIGHT

Treatment No.	1	2	3	4	5	6	7	8	9	10	11	12
—	Bits (lb)						Suckers (in. girth)					
	1	2	3	4	5	6	10	12	14	16	18	20
No. of hands/bunch ..	10·1	9·9	9·7	9·9	10·1	9·6	9·4	10·0	9·3	9·4	9·0	8·0
Weight of fruit/bunch (lb)	54·8	53·8	51·9	52·6	53·3	51·8	45·6	54·3	46·7	47·0	44·2	38·5

Significant differences (1%)—Hands per bunch—Treatment No. 1 to 11>>12 ; 1, 5>>11.
Bits>>Suckers.
Regression co-efficient for sucker size (linear) = −0·287.

Significant differences (1%)—Weight of fruit—Treatment No. 1, 2, 3, 4, 5, 6, 8>>12.
Bits>>Suckers.

Significant differences (5%)—Weight of fruit—Regression co-efficient for sucker-size (linear) = −1·885.

There were no significant differences in the number of hands per bunch in plants grown from bits, the average being 9·9. The bit series of plants, however, produced a significantly greater average number of hands than the sucker series, the mean difference being 0·7.

The number of hands per bunch was similar in plants grown from suckers with girths of 10 in., 12 in., 14 in. and 16 in. but declined slightly in plants grown from 18 in. suckers, and even more in those produced by the 20 in. size.

The regression co-efficient for plants grown from suckers, unlike that for those grown from bits, was significant in terms of hand number: for every increase of 2 in. in sucker girth, the number of hands decreases by 0·287.

Bunch weights for the several treatments show the same trends as the number of hands per bunch. This is not surprising, as both would be controlled to a large extent by the nutritional status of the plant. The average weight of fruit per bunch in plants grown from bits was 53 lb, with negligible differences between treatments. The corresponding mean value in plants grown from suckers was 46 lb, which was significantly lower than in the bit series.

It would appear that the size of bits is of little importance in selecting planting material, although in commercial practice the smallest size used (1 lb) would be considered unsatisfactory owing to the risk of a faulty strike if stress conditions occurred following planting. Large bits, on the other hand, are more difficult to transport, and larger butts are required for their preparation. The optimum weight, therefore, would probably be 2-4 lb.

The greater bunch size in plants grown from bits as compared with plants grown from suckers makes them a first choice as planting material. Where bits are not available, 12 in. suckers seem preferable to both larger and smaller sizes. They are easily removed from the parent plant, and they are generally in ample supply and fairly light to transport. Furthermore, the bunch size and fruit weight produced by the plants grown from them show a tendency (which does not quite reach significance) to be greater than those of plants grown from larger material.

(i) Total Number and Weight of Fingers

Although bunch weight is the usual criterion of productivity, bunch values are influenced to a considerable extent by the number and size of fingers because certain counts sell at a premium. Finger counts and weights are summarized in Table 9.

TABLE 9

NUMBER OF FINGERS AND WEIGHT PER FINGER

Treatment No.	1	2	3	4	5	6	7	8	9	10	11	12
—	Bits (lb)						Suckers (in. girth)					
	1	2	3	4	5	6	10	12	14	16	18	20
No. of fingers/bunch ..	169	164	157	158	167	160	151	162	149	152	140	120
Weight of finger (oz)	5·18	5·22	5·28	5·31	5·07	5·17	4·71	5·37	4·99	4·94	4·95	5·06

Significant differences (1%)—Number of Fingers—Treatment No. 1 to 10>>12 ; 1, 2, 5>>11.

Bits>>Suckers

Regression co-efficient for sucker size (linear) = −6·21

Significant differences (5%)—Regression co-efficient for bit size (linear) = −1·07.

Significant differences (1%)—Weight/Finger—Nil.

As with number of hands and net weight of fruit, size of bit planting material had no influence on the number of fingers per bunch. In the sucker series, the number of fingers followed the same trend as the net bunch weight, the lowest figure being recorded for the largest planting material. This reduction in finger number for the 20 in. suckers is more than can be accounted for by the lower number of hands, and it is evident that in this treatment the finger number was reduced over several if not all hands. As a group, plants derived from bits produced a significantly greater number of fingers per bunch than those from suckers, the difference being 17. The regression co-efficient for sucker size indicates that for each increase of 2 in. in sucker girth, the number of fingers per bunch decreases by 6·21. The regression co-efficient for bit size reached significance only at the 5 per cent. level, and in any case the figure is negligible.

Finger weight was apparently unaffected by the type or size of planting material used. Fruit filling is normally controlled largely by soil moisture and plant nutrients, and in this trial neither of these was a limiting factor. It is probable, however, that any restriction imposed by deficiency of plant nutrients would have resulted in a reduction in finger number in the first instance rather than affecting the average finger weight.

IV. CONCLUSIONS

(1) Plants grown from bits took a significantly longer time to emerge than those from suckers, the difference being six days. Bit plants, irrespective of size, appeared above ground at much the same time but the larger suckers emerged more quickly than the smallest size.

(2) Size of bit planting material had no appreciable effect on the period from planting to flowering, which was approximately 13 months, but the smallest suckers required a longer and the largest a shorter period. Plants from bits weighing 5 or 6 lb matured their bunches about two weeks earlier than plants from smaller bit sizes (1–4 lb). The period from flowering to maturity showed a linear regression in plants grown from suckers: the larger the sucker, the more quickly the bunch matured its fruit. The maximum difference between types of sucker planting material was 23 days.

(3) Plants grown from bits were more uniform in height, were taller (by 4 in.) and had a greater girth (by $1\frac{1}{2}$ in.) than plants grown from suckers. The average height of plants derived from bits was 66 in. Plant height was constantly equal to maximum stem girth $\times$ 2·3 in this trial. The average total number of leaves produced (juvenile plus adult) ranged from 40·1 for bits to 41·2 for suckers, and varied with size of planting material in both bit and sucker series of plants. Increasing size of planting material was associated with decreasing number of leaves.

(4) Neither size nor type of planting material had any effect on the total number of suckers produced. On the average, a plant produced 13 suckers before it bunched and 4 thereafter.

(5) Size of planting material, except in the 20 in. suckers, had no significant influence on the number of hands per bunch or the number of fingers per bunch, but sucker planting material invariably produced bunches with a lower number of hands (mean 9·2) than bit planting material (mean 9·9). The average number of fingers per bunch in the bit series was 163, this being 11·6 per cent. higher than the figure for suckers. Hand numbers per bunch in plants grown from 20 in. suckers were low, suggesting that these plants were lacking in vigour.

(6) The average net fruit weight per bunch from bit planting material was 53 lb, which was 15·2 per cent. greater than that from sucker planting material. Net fruit weight was not significantly affected by size of bit planting material, but showed a linear regression in plants grown from suckers, the larger sizes producing the smaller bunches. Fruit filling was apparently not affected by size or type of planting material used.

(7) Practical considerations would probably restrict bit weight to material within the 2–4 lb range and suckers to material about 12 in. in maximum girth.

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