

FURTHER OBSERVATIONS ON THE SELECTION OF POTTED SEEDLINGS

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Abstract

The results of six experiments indicated that few of the potential selections from single stools would be lost if the apparently least vigorous third of potted seedlings were discarded before planting out in the field. Single stools were established successfully by stalks taken from plants in the pots.

Introduction

It is common practice in sugarcane selection programmes to start with a large number of original seedlings. Relatively large numbers of seedling varieties are selected at each stage for carrying forward to subsequent stages for further testing. This system has been successful in producing superior commercial varieties but efforts to improve the procedure are constantly being sought. One possibility is to decrease the number of original seedlings (single stools) in the field, or to improve their quality, by selection among the young potted seedlings. A positive association in respect of mass and brix has been found between potted seedlings and single stools in the field (Thomas²).

Selecting for the better crosses on the basis of the progeny mean is another possible method of decreasing numbers in the early stages of selection programmes (Bond¹). This approach might also be feasible with potted seedlings.

In the breeding programme at Mount Edgecombe seedlings are grown in pots for six to eight months. They produce thin stalks up to one metre in length (Figure 1), which have been successfully used as seed material (Thomas²).



FIGURE 1 An example of a stand of potted seedlings grown in 1979.

The present study was done to determine the feasibility of discarding, say a third of the original seedling population at the potted seedling stage, without losing many potential selections from the single stool stage. The possibility of assessing the crosses at the potted seedling stage was also investigated.

Materials and Methods

At the Experiment Station true seed is sown in January and transferred to small pots in February. The pots have a volume of 0,56 l, and the plants are spaced 100 mm apart. The pots are filled with a mixture of sand, top-soil and compost. Irrigation is applied through perforated pipes about three times weekly, depending on the prevailing weather. The seedlings are later (about September) planted in the field. In three consecutive years samples of seedlings were measured on the day they were planted in the field.

In September 1977 105 seedlings from one cross were measured for both total mass above ground and stalk mass. A brix reading was obtained by extracting juice from the base of the stem. The stalks were then used as seed material to establish single stools on the Experiment Station farm, Location One. The stools were harvested 13 months later and cane mass and brix value determined.

In October 1978 204 seedlings from another two crosses were measured for total mass above ground, stalk mass and brix value. Forty two seedlings from each cross were planted in Location One, using the stalks as seed material. The remaining stalks from the two crosses were used to establish 120 single stools (60 per cross) on a sandy site on a nearby farm, Location Two.

The 1978 stools at Location One were harvested after ten months and cane mass and brix value determined. The 120 seedlings at Location Two were cut back after four months so as to fit in with the selection programme at that site. The stools were harvested 13 months after being cut back and mass and brix value measured.

In September 1979 50 potted seedlings from one cross were measured for both total mass above ground and stalk mass. The stalks were then trimmed to a length of 300 mm and planted in Location One. The single stools which grew from these setts were harvested at 11 months of age and total stalk mass per stool determined.

In February 1980 48 randomly chosen clones from each of the two crosses (L276 and L1106) planted out in 1978 were established in pots, using single-budded setts taken from single stools. For every clone there were three pots, each containing one sett. The plants were harvested after 22 weeks. The tops of the shoots were broken off at the natural breaking point and the remaining stalks weighed.

Results and Discussion

In 1977 the stalks harvested from the pots were particularly small, and nearly 30 percent of them did not germinate in the field. In all other cases establishment in the field was close to 100 per cent.

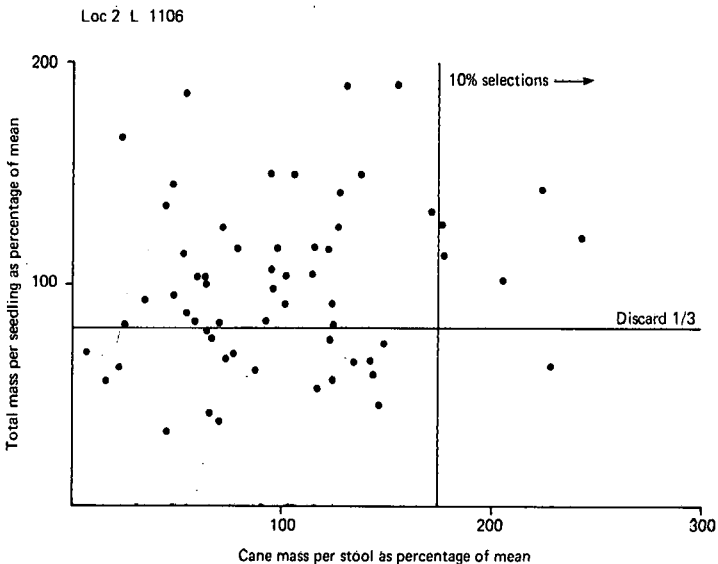
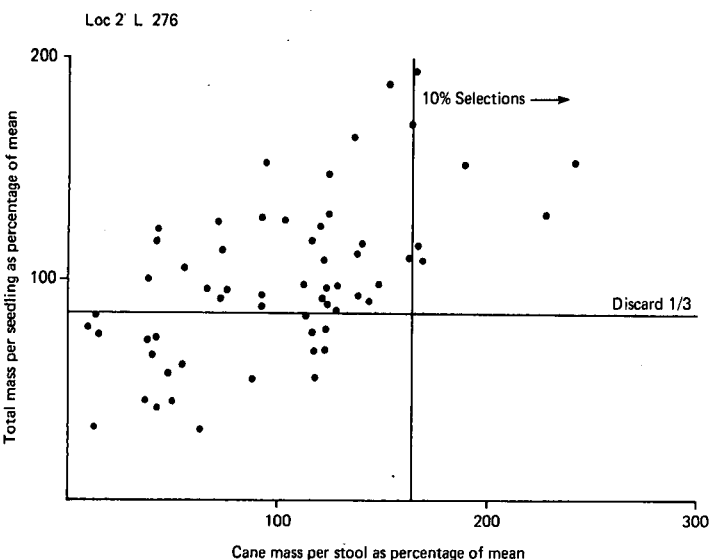
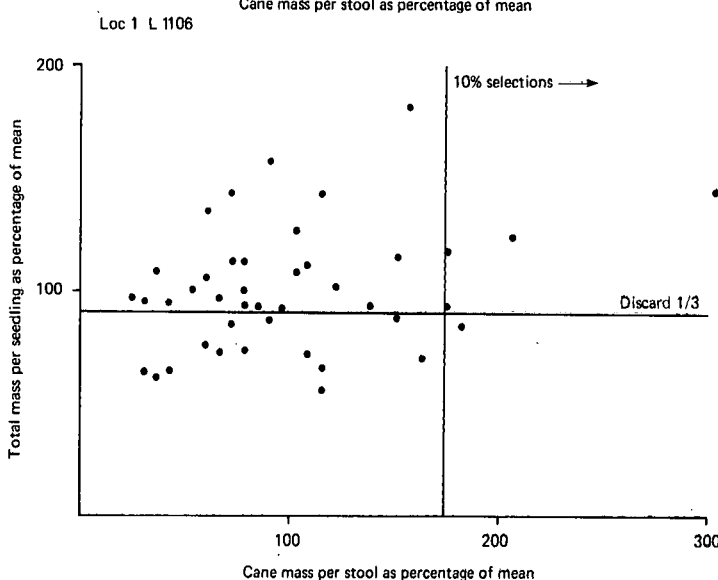
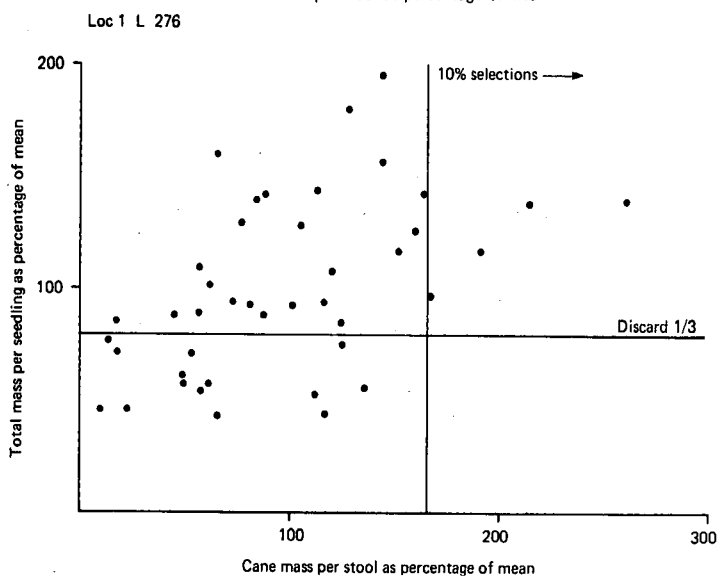
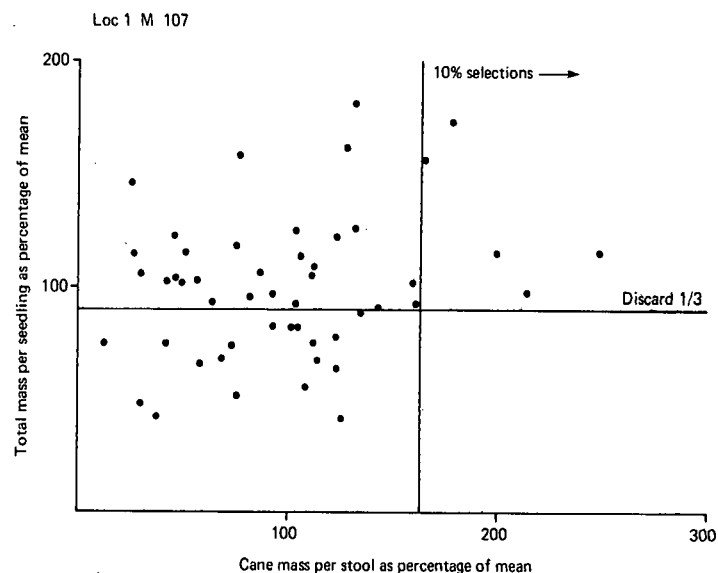
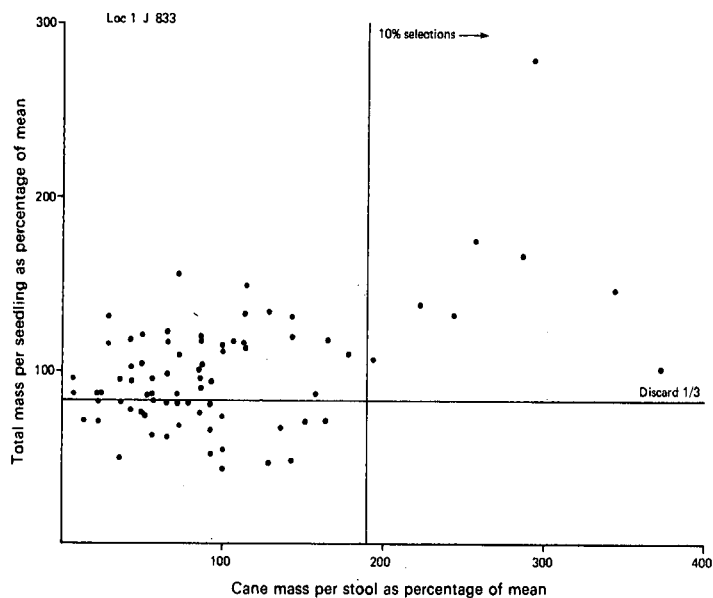


FIGURE 2 Scatter diagrams showing possible discards and potential selections.

Total mass and cane mass in pots were always positively correlated with cane mass in the field, although correlation coefficients varied substantially (Table 1).

Setts were all trimmed to the same length in 1979, but the planting of stalks of varying size in 1977 and 1978 may have caused the correlation coefficients for mass to be biased upward. However, any such bias could have been counter-

acted to some extent at Location Two because plants were cut back there at a young age.

The positive relationship between mass per plant in the pots and in the field suggests that some of the poorer potted plants could be discarded at the time of planting out, without causing the loss of many superior clones. Taking a selection rate of ten percent in single stools, two of the 34 plants with

the greatest mass of cane at the single stool stage would have been lost if in each experiment the lightest third of the potted seedlings had been discarded at the time of planting into the field (Figure 2). It appeared to make little difference whether total mass or stalk mass was used when selecting from among the potted seedlings.

The results suggest therefore that a selection programme could be done more economically by practising selection at the potted seedling stage. Discarding a proportion of potted seedlings would allow the amount of land and effort devoted to the single stage to be decreased without significant loss of good clones at the single stool stage. Alternatively, if a larger initial number of potted seedlings was established, to allow a proportion to be discarded without a decrease in the number of single stools, the average quality of plants at the single stage would be increased.

It would seem that the mean mass of potted seedlings could provide a useful estimate of the yield of the progeny of a cross at the single stool stage, which, in turn, is a measure of the potential of the cross to produce good varieties (Bond¹). Thus, in the 1978 experiments the plants of cross L276 were heavier on average than those of cross L1106 in the pots and in the field (Table 2). The results also suggest that differences in brix values between crosses can be assessed at the potted seedling stage. Similarly, when potted plants of these two crosses were established in 1980 from single-budded setts taken from single stools, the plants of cross L276 were generally heavier than those of cross L1106 (Table 3).

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TABLE 1

Correlation coefficients between potted seedlings and single stools

Year	Cross and location		Correlation coefficients		
			Total mass	Stalk mass	Brix
1977	J833	Loc 1 ..	0,48	0,36	0,42
1978	L276	Loc 1 ..	0,48	0,48	0,38
	L1106	Loc 1 ..	0,29	0,40	0,22
	L276	Loc 2 ..	0,61	0,54	0,24
1979	L1106	Loc 2 ..	0,16	0,12	0,14
	M107	Loc 1 ..	0,23	0,24	—

TABLE 2

Mean mass per plant and brix values for two samples of progeny from each of two crosses grown in pots and in the field (1978)

Cross	Pots		Field		
	Seedling mass (g)	Brix	Location	Cane mass (Kg)	Brix
L276	238,0	18,2	1	3,5	19,3
L1106	201,5	18,7	1	2,4	20,0
L276	237,3	18,6	2	21,0	19,3
L1106	211,8	19,0	2	15,8	19,4

TABLE 3

Mean stalk mass of plants from crosses L276 and L1106 established with setts in pots, in 1980

Replicate	Cross L276 g/stalk	Cross L1106 g/stalk
1	28,4	32,5
2	28,9	24,8
3	32,6	25,3
Mean	30,0	27,5