

SELECTION IN POTTED SEEDLINGS

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Abstract

Two experiments were conducted to determine whether varieties selected in field trials "field selections" and commercial varieties occurred amongst the lower yielding plants at the potted seedling stage. Total above ground mass was determined for each plant. Few selections or commercial varieties occurred in the lightest 30 and 50% of the plants.

In a third experiment, 2 680 original seedlings growing in pots were assessed by eye for vigour. Approximately 25% of the least vigorous plants were classified as "discards". A sample of 400 of the discards was sent through the normal field selection programme together with the 2 010 plants regarded as selections. No clones from amongst the discards reached stage IV of the field selection programme. Also, at earlier stages the selections outyielded the discards.

Introduction

Earlier studies have shown a positive correlation between the total mass of 7–8 month old potted seedlings and cane mass in the field (Thomas⁴). Few superior clones are lost if the least vigorous plants are discarded at the potted seedling stage (Thomas³). If a larger number of seedlings than that required for the selection programme were produced, the least vigorous plants could be discarded before planting out into the field selection programme; in consequence the general level of the material entering the selection programme should be improved.

At Mount Edgecombe seedlings are normally kept trimmed in pots for 7–8 months before being planted out into the field; in most other breeding programmes seedlings remain in pots for only 2–3 months before transplanting (Breux and Miller¹). If left untrimmed for the longer period each potted seedling produces one thin stalk about 0,5 m in length at the spacing used (100 x 100 mm). Any tillers die out because of the intense competition at this close spacing (Fig 1).



FIGURE 1 A stand of untrimmed potted seedlings

The individual stalks can be cut and used as seedcane (Thomas²).

This present study was done to assess the degree to which potentially good varieties are likely to be lost if the least vigorous plants are discarded at the potted seedling stage.

Materials and Methods

Seedlings were started in trays before being transferred to pots. Airbricks served as convenient pots (see Fig 1), giving a plant spacing of approximately 100 x 100 mm. The seedlings for all the trials were grown for 7–8 months. Setts slightly more than 20 mm long were cut from the small stalks and used to establish stage I (single stools) of the field programme (Fig 2).

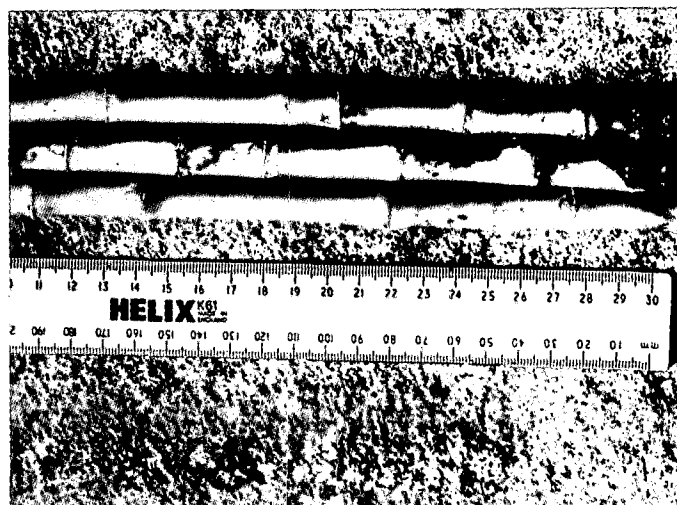


FIGURE 2 Miniature stalks

Experiment 1

Before being transferred to the field as part of the first stage of the normal selection programme, 204 potted seedlings, originating from two biparental crosses were weighed individually for total above ground mass. Eleven clones reached Stage III of the field selection programme, and were classified as field selections.

Experiment 2

Seed was sown of 4 biparental crosses, from each of which one or more commercial variety had been obtained in the past. The seedlings (320 in total) were planted in the field to provide propagation material of each seedling. A single-budded sett was taken from each plant in the field to establish the equivalent of an unselected seedling population in pots. The plants originating from a particular cross were placed together, as they would have been in the normal programme. In randomly chosen positions amongst them were placed plants, also derived from single-budded setts, of commercial varieties originating from the cross. Approximately 7 months later the total above ground mass of each plant was measured.

In experiments 1 and 2 the individual plants were ranked according to their total determined mass, but only within batches of between 40–60 adjacent plants in the pots. The occurrence of field selections and commercial varieties ranked in the lower 30% and 50% of each batch were recorded.

Experiment 3

A total of 2 680 seedlings derived from a number of crosses were established in pots. At the time of planting out in the field, 40 adjacent seedlings at a time were cut and laid on a table for visual selection of vigour. Ten of the least vigorous plants were identified as those that would normally be discarded; the remaining 30 plants were designated selections. This process was repeated with all the seedlings until there were 2 010 "selections" and 670 "discards". Of the 670 hypothetical discards, 400 were planted in the field as single stools together with the 2 010 selections. All the stools were then treated as part of the routine field selection programme, where mass estimated recoverable sugar is determined for each clone from Stage I onwards. At Stage I, in the present experiment, mass cane per stool was estimated on a randomly selected sample of 200 stools from both the selections and the discards.

Results and discussion

If, at the potted seedling stage in Experiments 1 and 2, the lightest 30% of the plants had been discarded, only about one tenth of the potentially good varieties would have been lost (Table 1). Even if 50% of the seedlings had been discarded, about three quarters of the seemingly best varieties would have been retained.

Table 1

The number of Stage III field selections and commercial varieties occurring amongst lower yielding plants at the potted seedling stage

Experiment	Number of		Number of selections occurring	
	Seedlings	Selections	in lower 30%	in lower 50%
1	204	11	1	3
2	310	13	2	3
Totals	514	24	3	6

At the time of harvest at Stage I in Experiment 3, the stools originally designated "selections" were considerably heavier on average than "discard" stools (Table 2). The mass of clones taken forward to subsequent stages suggests that the best clones from "selections" possessed an advantage in respect of sugar yield over the best clones from "discards".

Table 2

Yields of 'selections' and 'discards' in successive stages of the field selection programme (Experiment 3)

	Stage I kg/stool	Stage II ters/ha	Stage III ters/ha
Selections	11,2	10,4	15,3
Discards	8,5	6,6	12,0

Moreover, none of the clones designated discards survived to reach Stage 4 (replicated variety trial) of the normal selection programme (Table 3). Thus the results of Experiment 3 provide further evidence that few outstanding varieties would be lost if the smallest seedlings were discarded at the potted seedling stage.

Table 3

Number of clones in successive stages of selection and proportion (%) brought forward from previous stage (Experiment 3)

	Stage I	Stage II	Stage III	Stage IV
'Selections'	2 010	180 (9,5%)	20 (10,5%)	4 (20%)
'Discards'	400	32 (8,0%)	3 (8,3%)	0 (0%)

Conclusion

Because sugarcane is a perennial crop and plants are large, breeding work is expensive. The present study suggests that if about 50% more than the normal number of seedlings were produced (this would be comparatively inexpensive), a third of these could be discarded at the time of placing in the field; the existing size of the field programme would be maintained, but the number of outstanding varieties reaching the variety trial stage should increase substantially. Thus the present results support the findings in earlier studies (Thomas^{2,3,4}).

REFERENCES

1. Breaux, RD and Miller, JD (1987). Seed handling, germination and seedling propagation. In: Heinz, DJ (Ed). *Developments in crop sciences II. Sugarcane improvement through breeding*. Elsevier, Amsterdam: 385–407.
2. Thomas, DW (1978). Some observations on propagation and selection in young potted sugarcane seedlings. *Proc S Afr Sug Technol Ass* 52: 193–194.
3. Thomas, DW (1981). Further observations on the selection of potted seedlings. *Proc S Afr Sug Technol Ass* 55: 143–145.
4. Thomas, DW (1983). Selection in potted seedlings: its possible use and benefits. *Proc int Soc Sug Cane Technol XVIII* 676–681.