

PLANTING PROCEDURES AND MATERIALS FOR IMPROVING GERMINATION AND TILLERING OF SUGARCANE IN THE RAINFED AREAS OF NATAL

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Abstract

The results are reported of six field experiments designed to compare the effects of various planting procedures and materials on the early development of the plant crop under rainfed conditions. Planting by machine in moist soil increased germination, tillering and stalk elongation compared to the standard procedure of drawing furrows and planting by hand some hours later in soil that had dried. A delay in planting by hand after opening the furrows substantially reduced germination and subsequent tillering. When planting into dry soil germination, tillering and stalk elongation was increased by planting with 40 t/ha filtercake in the furrow or by pouring 2 to 3 l water per metre of row on top of the setts prior to covering. A liquid copolymer sprayed over the row after covering marginally increased shoot population and stalk elongation in two of the four experiments.

Introduction

Because of the unpredictability of rainfall in Natal there is always the likelihood of dry conditions prevailing at planting time and this commonly results in poor stands of plant cane and the subsequent ratoon crops. It is expensive to re-establish a cane field and it is important to ensure, as far as possible, that germination and subsequent tillering are good. Slow and uneven germination generally create a weed problem in the cane row, extend the time to full leaf canopy and are likely to reduce cane yields and also the number of ratoons that can economically be obtained from a single planting.

Young, well fertilized, disease-free seed is essential for establishing a good stand of cane and the quantity of seed per hectare should be more than enough (7 to 10 tons of NCo376) to prevent gaps occurring in the cane row. Improved planting techniques can also contribute towards the attainment of a full stand of cane.

Because labour requirements are greatest in spring and summer when harvesting, weeding, fertilizer application and planting may all be under way, there is a logical trend in parts of the industry to plant in winter and early spring. Temperature rather than moisture may be the limiting factor at this time of the year and plastic film over the planting furrow has been shown to accelerate germination substantially and to increase tillering, depending to some extent on soil type (Millard and Rau¹). This effect was attributed both to increased soil temperature and to moisture conservation. Unfortunately, the current price of PVC plastic film is such that this technique is not economically warranted. An alternative in the form of a liquid styrene-octyl acrylene copolymer (Reverseal 5) was reported to improve germination and tillering when applied over the row after planting in sandy soil (Bishop², Bishop and Kruger³).

Filtercake has been used for many years in the industry as a planting aid, particularly in winter. Various planting aids have recently been tested in experiments as the SASA La Mercy substation and the results are presented in this paper.

Experimental Procedure

Sites

Sites were selected for six field experiments at La Mercy on the North Coast. The soils are in the Umzinto and Berea soil systems and range from a deep, well-drained grey sand (Fernwood series) to a deep, grey sand overlying clay with an intermittent water table (Kroonstad series), and dark grey sandy loams merging, via alluvial tongues, to weathered rock (Swartland series).⁴ Some physical and chemical soil properties are presented in Table 1.

TABLE 1
Physical and chemical soil properties at 0-200 mm depth

Expt.	Soil series	Clay %	Approx. A.M.C.* mm/cm	pH	P ppm	K ppm	Ca ppm	Mg ppm
1	Fernwood	6	0,7	5,3	49	59	110	27
2	Swartland	40	1,3-1,6	5,7	19	94	>1800	> 220
3-6	Kroonstad	7	0,7	5,4	17	17	194	61

* AMC = available moisture content

Treatments and materials

The planting procedures and treatments tested are listed in Table 2.

TABLE 2
Treatments tested in each experiment

Treatment	Planting date	Experiment					
		1 Sept 1977	2 May 1978	3 Nov 1978	4 Dec 1978	5 Feb 1979	6 April 1979
Machine planting		*					
Simulated machine planting			*	*	*	*	*
Delayed hand planting (Standard)		*	*	*	*	*	*
plus filtercake		*	*	*	*	*	*
plus water		*	*	*	*	*	*
plus Reverseal 5				*	*	*	*
Setts overlapped		*	*	*	*	*	*
Setts spaced				*	*	*	*

The standard treatment (or delayed planting) involved drawing the furrows with a ridger body to a depth of about 150 mm, delaying planting for about 24 hours, and then covering the setts with 40-50 mm of soil.

Machine planting was carried out by a chopper type single-row planter adapted to spray chopped setts with fungicide. The machine placed 4 to 5-eyed setts, overlapping by about 50%, into a furrow about 100-150 mm deep and covered immediately with 40 mm of soil.

Simulated machine planting was used in five out of the six experiments because of the inconvenience of using a tractor and planting machine in small plots. The treatment involved drawing furrows with a ridger body as in the standard treatment, placing the setts and covering them immediately by hand in order to minimise evaporation of moisture from the open furrow. The depth of furrow, quantity of seed and depth of covering were all similar to those described for the standard treatment.

Filtercake: the method used was the same as that described for the standard treatment but about 40 tons of filtercake per hectare were applied on top of the setts before covering with soil. The filtercake used in experiments 1 to 5 was relatively fresh (3-5 months old) and on average contained 64% moisture. In experiment No. 6 older filtercake (about seven months) was used and it contained only 37% moisture.

Water planting: the procedure followed was the same as that described for the standard treatment, but before covering water was applied over the setts with a watering can at a rate of 2 to 3 l per metre of cane row. With a row spacing of 1,4 metres and an application rate of 2,5 l per m of row, the quantity of water used was about 18 000 l per hectare.

Reverseal 5: planting was carried out as described for the standard treatment, but after covering the setts Reverseal 5 was applied by means of a knapsack sprayer over the row in a band 200-300 mm wide, and at a rate of 100 l product in 5 000 l water per hectare. The application thoroughly wet the soil surface and a distinct crust was formed when it dried.

The variety NCo376 was used in all trials and the average age of seed was 14 months. All hand planting was done with 4 to 5-eyed setts which had been treated with Benlate, and which were either overlapped by about 50% or spaced about 150 mm apart.

Fertilizer was applied according to recommendations based on soil analyses. Phosphorus was required in the planting furrow in all experiments except No. 1, and potassium and nitrogen were applied as a top dressing some months after planting to all experiments.

Experiment Design

Because it was intended to observe the effects of the treatments only on the early development of the crops, the experiments were terminated after about six months. Yields may well have been affected differently by the various planting methods, but the purpose of the project was only to study means of obtaining good germination and tillering.

Each treatment was replicated three times in a randomised block design and the plots comprised two rows five metres long and 1,4 metres apart.

Results and Discussion

The effects of treatments on shoot populations, and in some instances on stalk elongation as well, at different times of the year, together with rainfall data are presented in Figure 1.

Machine planting and simulated machine planting into soil which was moist in spring, summer and autumn, substantially increased germination, tillering and stalk length when compared with the standard planting procedure. Simulated machine planting into dry soil in winter did not improve germination or tillering. The advantages of machine

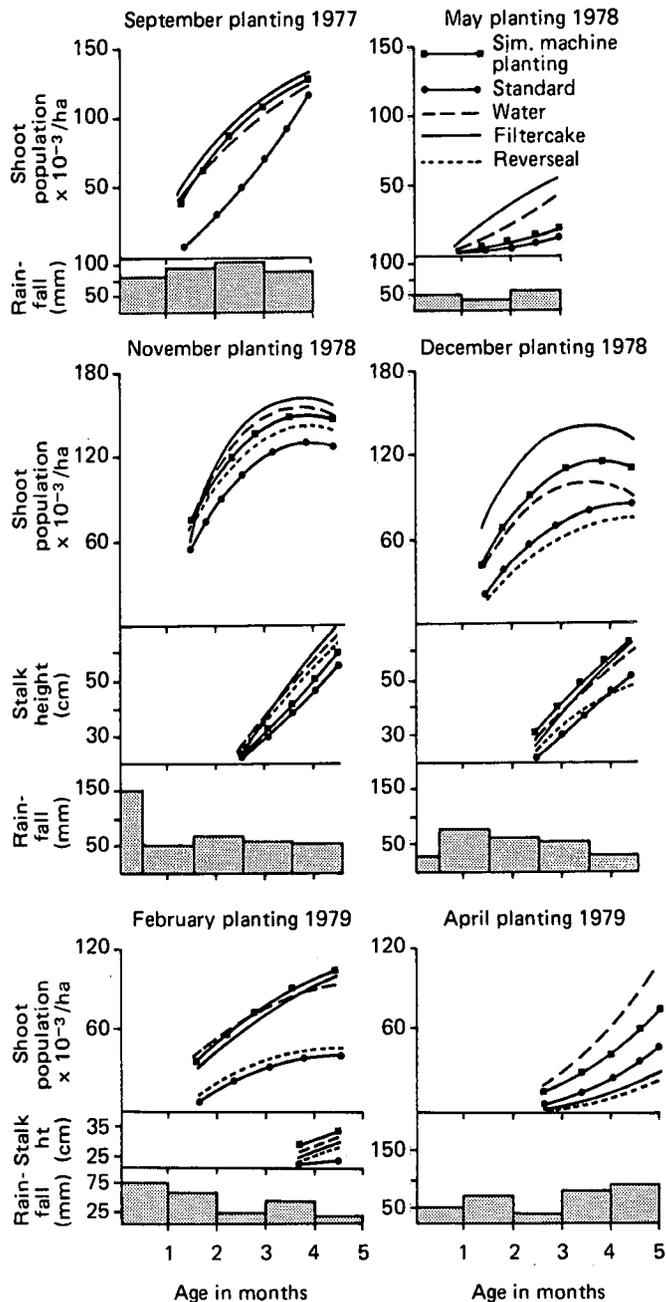


FIGURE 1 The effect on shoot population and stalk length of different planting procedures.

planting are that it produces a relatively flat surface area with a very small ridge; that about two hectares can be planted per eight hour day; and that it requires only about nine labourers per hectare compared with about 30 for hand planting⁵. The method is restricted to slopes less than about 25%.

Fresh filtercake increased germination, tillering and stalk elongation at all times of the year when compared with the standard planting procedure, while old filtercake had very little effect. The moisture content of the filtercake appears to be important for stimulating growth, particularly when planting at a dry time of the year, but even fresh filtercake has been reported to suppress germination when used in a dry winter on Recent Sands (Moberly and Meyer⁶). Compared to the standard planting procedure watering of the setts in the furrow substantially increased germination, tillering and stalk elongation at all times of the year, but it was slightly less effective than fresh filtercake. Water could nevertheless be used as a substitute for filtercake and it could be transported into the field and applied from a tractor-drawn water tanker, with a considerable saving in time and cost.

Reverseal 5 increased germination, tillering and stalk length marginally in experiments 3 and 5, in which good rain was recorded soon after planting, but it had no effect in experiments 4 and 6 when only a negligible amount of rain fell soon after planting.

The effects of sett spacing on germination and tillering when planting with or without filtercake and with simulated machine planting are shown in Figure 2.

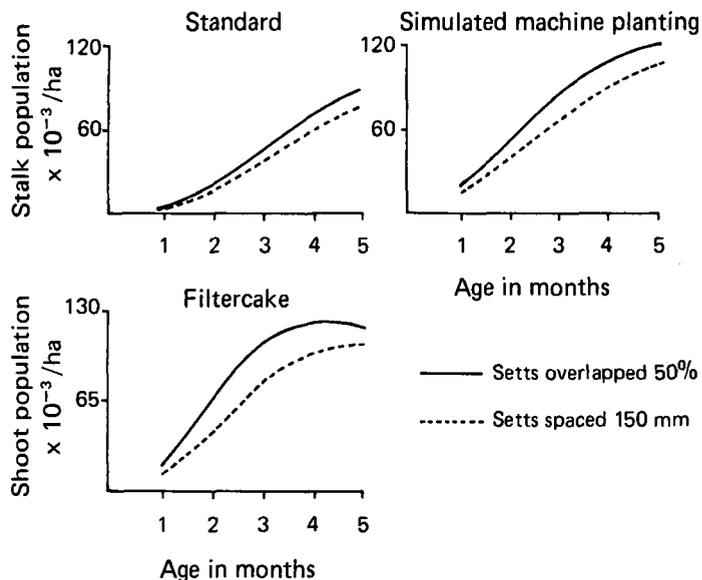


FIGURE 2 The effect on shoot population of using two seed rates with different planting procedures

The number of shoots was lower where setts were spaced 150 mm apart compared to setts overlapped by approximately 50%, even in the presence of filtercake or water.

With the use of planting aids however it is likely that the seed rate could be reduced but not to the extent of spacing setts 150 mm apart.

Conclusions

- Machine planting and hand planting immediately after drawing the furrow are recommended where the soil is moist.
- Filtercake is a valuable planting aid in dry soil and where planting furrows have been allowed to dry out before planting. Fresh filtercake is preferred for stimulating germination and tillering.
- Water is nearly as effective as fresh filtercake under dry conditions and would be cheaper to apply although the nutrient content of filtercake cannot be ignored.
- Reverseal 5, used under the conditions described above, had relatively little effect on germination and tillering.
- Quantities of seedcane should not be reduced too greatly when using planting aids to improve germination and tillering.

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