

INTRODUCTION OF A SEEDCANE IMPROVEMENT SCHEME IN THE CENTRAL ZULULAND EXTENSION AREA

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Abstract

A seedcane improvement scheme was introduced in Central Zululand in 1980, in an attempt to raise the quality of seedcane used in the area. Growers were asked to submit their potential seedcane fields for inspection to determine if they were free from major diseases and to determine their trueness to type. Surveys revealed that 9% of the fields contained mosaic and in 61% the main variety was mixed with unwanted varieties. Of the fields inspected for the presence of smut, mosaic and mixed varieties, 20% were healthy, true to type and suitable for immediate use as seedcane; 30% contained less than 0.5% diseased or off-type stools but needed roguing before they could be used as seedcane; and 44% contained more than 0.5% diseased and off-type stools and were unsuitable for use as sources of seedcane. This information enabled the participating growers to reject those fields unsuitable for seedcane and take appropriate action to obtain only healthy, good quality seed material.

Introduction

The production of high quality seedcane specifically for planting material is seldom practised on South African sugarcane farms, where the normal procedure is to select at planting time from the best-looking fields of cane where the age is from 12 to 18 months. Seldom is seedcane produced in a proper nursery, with carefully exercised hygiene, to supply the requirements of future planting programmes. This is in sharp contrast with many other agricultural crops where seed is produced under strict control to ensure the best possible quality and freedom from disease.

The build-up and spread of diseases in sugarcane occurs more readily than in other crops because it is a perennial crop of 10 or more years duration; it is propagated vegetatively; there is a wide variation in ages of adjacent fields; and difficulty is experienced in eliminating completely the old crop. The production of healthy seedcane therefore requires particular attention to overcome these problems.

A deteriorating situation with regard to diseases of sugarcane in South Africa has recently been described (Bailey²). Three important diseases, smut, mosaic and ratoon stunting disease, were reported to be spreading and causing substantial losses in crop production. It is certain that this build up in recent years can be attributed largely to the poor quality of seedcane used. This situation could deteriorate further, unless there is an all-out drive to ensure that only disease-free cane is used at planting, and this can be accomplished only by improving the methods of producing seedcane.

Attempts have been made in the past to upgrade the quality of seedcane by encouraging growers to establish seedcane nurseries. In 1970 the SASA Experiment Station introduced the Seedcane Approval Scheme, which requires the producer to register his nursery and follow strict guidelines for hygiene and management. Regular checks by disease inspectors are undertaken and if all the inspections are satisfactory the nursery receives a Certificate of Approval. For various reasons, few registered commercial nurseries have been developed and little impact has been made by this scheme on the serious disease situation.

In 1979, an Extension Committee of cane growers was established in Central Zululand as part of the development of the SASA Experiment Station's Extension Service (Paxton³). The committee recognised the need for a project to tackle the deteriorating disease situation, and as a result of a disease survey in that year, the Seedcane Improvement Scheme for Central Zululand was devised in 1980. The objective of the scheme was to check all potential seedcane in the area and advise the growers on its suitability as planting material.

Procedure

All growers in the area were notified in April 1980 of the aims and objects of the Scheme and were asked to complete a questionnaire to provide the following information on potential seedcane for the planting season commencing in September, 1980:

1. A list of fields of potential seedcane for the planting season giving area, variety, age and estimated yield.
2. Expected surplus of seedcane which might be available for sale.
3. Expected shortfall of seedcane which would have to be purchased (Information from points 2 and 3 would enable the Extension Officer to put growers with seedcane to buy and sell in touch with each other).
4. A list of new varieties, with areas, already on the farm, to ensure these were checked to establish their freedom from disease and trueness to type.

A list of growers and their fields was compiled and a programme of tests and inspections drawn up for implementation during the winter months.

STEP 1 :

A total of 234 potential seedcane fields were sampled and examined for the presence of RSD. The disease was diagnosed by microscopic examination of fibrovascular sap extracts from mature cane stalks for the presence of the characteristic RSD bacteria. The technique is in common use by the Experiment Station for surveying the incidence of RSD in South African cane fields (Anon¹). Where RSD was diagnosed the grower was informed that the cane from relevant fields was unsuitable for use as seedcane.

STEP 2 :

Fields in which RSD was not found were then inspected for the presence of smut, mosaic and stools of off-type varieties. A total of 213 fields was inspected. The inspections were based on 20 randomly-selected sites in each field (30 sites in fields exceeding 5 ha), so that approximately 3-6% of the cane in each field was closely examined. The numbers of diseased and off-type cane stools found at the inspection sites in each field were expressed as percentages of the total number examined.

STEP 3 :

A report on each field was sent to the grower together with one of the following recommendations :

- (i) suitable for seedcane.

- (ii) could be used for seedcane, subject to the removal of low levels of infected stools or unwanted varieties.
- (iii) unsuitable for seed, the level of diseased and off-type stools exceeding 0,5%. (This threshold value has been arbitrarily chosen as the level at which roguing of unwanted stools is still a feasible operation).

The main part of the programme was completed by the end of October, 1980, enabling all participating growers to embark on their planting programmes having determined their sources of suitable seedcane. The scheme has continued to operate and will be improved for the 1981/82 season.

Results and Discussion

The Central Zululand Extension Area comprises four separate districts. Entumeni and Melmoth are both high altitude, good rainfall areas. Nkwaleni is a low altitude, fully irrigated area and Heatonville is a low altitude area receiving marginal rainfall.

The grower response to the scheme was 72%. This surprisingly high level indicated the intense interest that growers had in the scheme and ensured that a high proportion of the seedcane used in 1980/81 was included in the project. In their returns, 30% of the growers indicated they would have no seed of their own, which highlighted the severity of the drought over the two-year period 1979-1980. Subsequently a number of fields deteriorated to the point where they also became unsuitable for seed as the drought situation worsened later in the winter. Of the growers participating in the scheme 9% indicated that they had a surplus of seedcane which would be available for sale.

Ratoon stunting disease

The extent of RSD is shown in Table 1. It can be seen that there was a marked variation in the incidence of this

TABLE 1
Incidence of RSD in potential seedcane fields in Central Zululand, 1980

| District | Variety | No. fields sampled | No. fields with RSD |
|--------------------|--------------|--------------------|---------------------|
| Melmoth | NCo 376 | 67 | 0 |
| | NCo 293 | 10 | 0 |
| | CB 36/14 | 3 | 0 |
| | N7 | 1 | 0 |
| | TOTAL | | 81 |
| Entumeni | NCo 376 | 32 | 3 (9%) |
| | NCo 293 | 13 | 0 |
| TOTAL | | 45 | 3 (7%) |
| Nkwaleni | NCo 376 | 34 | 5 (15%) |
| | NCo 310 | 3 | 0 |
| | N52/219 | 5 | 1 |
| | N11 | 5 | 0 |
| | N12 | 1 | 0 |
| | TOTAL | | 48 |
| Heatonville | NCo 376 | 38 | 5 (13%) |
| | NCo 310 | 12 | 6 (50%) |
| | N55/805 | 6 | 0 |
| | Mixed | 4 | 2 (50%) |
| TOTAL | | 60 | 13 (22%) |
| GRAND TOTAL | | 234 | 22 (9%) |

disease between the districts. The levels of RSD in the fields which had been selected as potential seedcane fields were disturbing, although they were not as high as the levels in a random sample of commercial cane from three of the districts carried out in 1979. The levels observed during the 1980 survey of seedcane from commercial fields compare with those for the 1979 survey as follows :

| | 1980 | 1979 |
|-------------|------|------|
| Melmoth | 0% | 25% |
| Entumeni | 7% | 29% |
| Heatonville | 22% | 28% |

Smut

Smut incidence is increasing in commercial cane in the low altitude areas of Heatonville and Nkwaleni. The survey data in Table 2 show that 35% of all fields at Heatonville contained more than 0,5% stools infected by smut, precluding these fields from use as sources of seedcane. Nkwaleni had 5% of fields in this category. In the high altitude areas of Melmoth and Entumeni only one field with smut was recorded.

There was a disturbing proportion of fields with traces of smut (less than 0,5% infected stools). At both Nkwaleni and Heatonville these fields represent a hazard should they be used for seedcane without first being rogued. At Nkwaleni, 25% of the fields largely of the variety NCo376, were in this category. This indicates that a serious build-up of smut in this important variety could be imminent. At Heatonville 16% of fields were infected with smut at a level below the 0,5% threshold.

Comparing the survey data of commercial cane in 1979 with that obtained in the 1980 seedcane survey, the data again show a lower incidence of smut in the potential seedcane :

| | 1980 | 1979 |
|-------------|------|------|
| Nkwaleni | 30% | 72% |
| Heatonville | 51% | 87% |

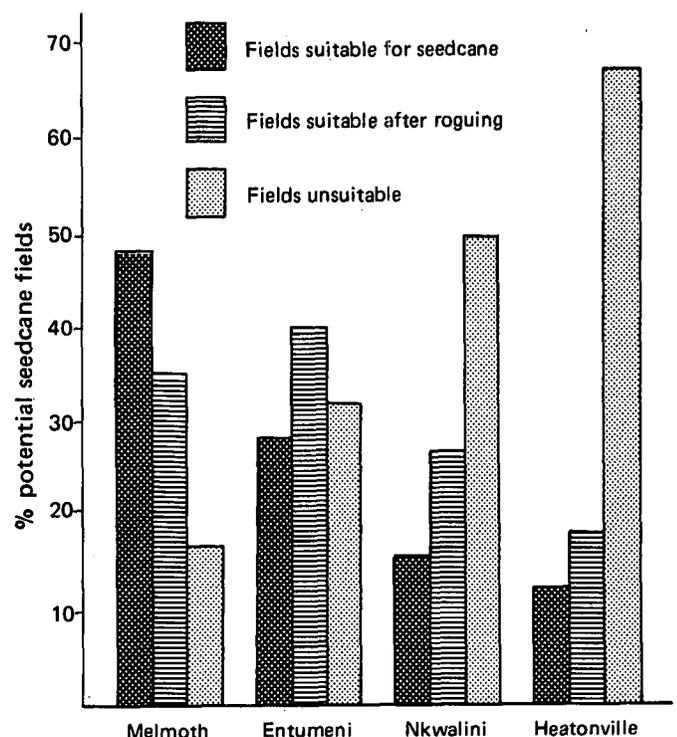


FIGURE 1 Suitability of potential seedcane fields in Central Zululand, 1980.

TABLE 2
Potential seedcane fields in Central Zululand contaminated with smut and mosaic, 1980

| District | Variety | No. fields inspected | Smut | | Mosaic | |
|----------------------|----------------------|----------------------|---------------|---------------|---------------|---------------|
| | | | > 0,5% stools | < 0,5% stools | > 0,5% stools | < 0,5% stools |
| Melmoth | NCo 376 .. | 50 | 0 | 0 | 5 | 15 |
| | NCo 293 .. | 1 | 1 | 0 | 0 | 0 |
| | N7 | 2 | 0 | 0 | 0 | 0 |
| | N11 | 1 | 0 | 0 | 0 | 0 |
| | TOTAL | | 54 | 1 (2%) | 0 | 5 (9%) |
| Entumeni | NCo 376 .. | 61 | 0 | 0 | 1 | 7 |
| | NCo 293 .. | 13 | 0 | 0 | 0 | 0 |
| | N8 | 2 | 0 | 0 | 0 | 0 |
| | N11 | 2 | 0 | 0 | 0 | 0 |
| | TOTAL | | 78 | 0 | 0 | 1 (1,5%) |
| Nkwaleni | NCo 376 .. | 30 | 0 | 8 | 5 | 4 |
| | NCo 310 .. | 2 | 2 | 0 | 0 | 0 |
| | N52/219 .. | 5 | 0 | 0 | 0 | 0 |
| | N11 | 6 | 0 | 2 | 0 | 0 |
| | N12 | 1 | 0 | 1 | 0 | 0 |
| | TOTAL | | 44 | 2 (5%) | 11 (25%) | 5 (11%) |
| Heatonville | NCo 376 .. | 20 | 2 | 4 | 2 | 0 |
| | NCo 310 .. | 11 | 6 | 1 | 0 | 0 |
| | N55/805 .. | 6 | 5 | 1 | 0 | 0 |
| TOTAL | | 37 | 13 (35%) | 6 (16%) | 2 (5%) | Nil |
| GRAND TOTAL | | 213 | 16 (8%) | 17 (8%) | 13 (6%) | 26 (12%) |

TABLE 3
Potential seedcane fields containing mixed varieties in Central Zululand 1980

| District | Variety | Off-types > 0,5% stools | Off-types < 0,5% stools |
|----------------------|----------------------|-------------------------|-------------------------|
| Melmoth | NCo 376 | 2 | 9 |
| | NCo 293 | — | — |
| | N7 | 1 | — |
| | N11 | — | — |
| | TOTAL | | 3 (6%) |
| Entumeni | NCo 376 | 18 | 31 |
| | NCo 293 | 6 | 3 |
| | N8 | 1 | 1 |
| | N11 | — | — |
| TOTAL | | 25 (32%) | 35 (45%) |
| Nkwaleni | NCo 376 | 14 | 5 |
| | NCo 310 | 2 | 3 |
| | N52/219 | 4 | 1 |
| | N11 | 4 | 1 |
| | N12 | 1 | — |
| | TOTAL | | 25 (57%) |
| Heatonville | NCo 376 | 9 | 4 |
| | NCo 310 | 6 | 3 |
| | N55/805 | 1 | 1 |
| TOTAL | | 16 (43%) | 8 (23%) |

Mosaic

Mosaic is a disease which is widespread and damaging at high altitude, but is present in all districts. Table 2 shows that the disease is most common at Melmoth, where 9% of designated seedcane fields contained more than 0,5% infested stools and were therefore considered unsuitable for seedcane.

The comparison between the 1980 seedcane survey data and the 1979 survey data of commercial fields is :

| | 1980 | 1979 |
|-------------------|------|------|
| Melmoth | 37% | 77% |
| Entumeni | 11% | 0% |
| Nkwaleni | 20% | 10% |
| Heatonville | 5% | 0% |

Varietal Impurity

The degree of mixing of varieties is illustrated in Table 3. It can be seen that at Melmoth, a relatively new area where NCo 376 has been grown extensively and there has therefore been less chance of mixing occurring, 22% of fields contained mixed varieties. This is lower than the figures for the other districts where the levels ranged from 65% to 80%. Altogether, 32% of fields contain more than 0,5% of other varieties, which is the level considered unsatisfactory for seedcane. Below this level the cane was accepted as suitable providing it was first rogued to eliminate the unwanted varieties.

In addition to collecting the above data, the field inspection team made assessments of the incidence of eldana, the effects of the drought and frost, and the general appearance of the cane in relation to its suitability for use as seed.

The Quality of Seedcane

Figure 1 reveals the extent of the factors limiting the quality of seedcane seen in the surveys. The combination of all the factors which make a crop unsuitable for use as seedcane has meant that only 60 fields out of a total 234 were ideally suitable for seedcane (26%). A further 69 (30%) required roguing due to traces of disease or unwanted varieties. A total of 109 fields (44%) submitted in the Seedcane Improvement Scheme were rated unsuitable for use as planting material.

It is interesting to note how widely the quality of seedcane varied between the four districts in the scheme.

Conclusions

The survey has highlighted a number of important factors. In particular, without a scheme of this nature, cane from almost one half of the fields selected by growers in Central Zululand in 1980 might have been used as seedcane despite being seriously contaminated with diseases and significant mixing of varieties. It also confirms the growing concern that there is only a limited quantity of good quality seedcane available in the industry.

The scheme has shown that poor quality seedcane is one of the main reasons why diseases are becoming more serious in the cane crop. The problem is aggravated by the widespread presence of volunteers which act as a source of infection to the newer varieties. The fact that our main variety, NCo 376, so often contains rogue plants of NCo 310 and N55/805, both of which are susceptible to smut, may partly explain why smut is becoming more common in NCo 376.

There are two other noteworthy features of the first year of operation of the scheme. The fact that 72% of the growers in the area participated in the project shows the widespread interest they have in improving the current position. Whilst it is too early to evaluate the benefits of the scheme, it

enabled these growers to select their seedcane from stock free from disease.

The scheme has also demonstrated that there is considerable scope for improving the quality of seedcane further. It does not offer an alternative to seedcane production from registered nurseries but it provides a service to all growers to ensure that diseased material is not used for seedcane. It is a practical method for controlling the quality of seedcane and one that could readily be implemented throughout the sugar industry. The Seedcane Improvement Scheme will continue in the 1981/82 season, following similar procedures. In view of the high incidence of disease, growers in the area have been requested to establish new nucleus stocks of disease-free cane which is true to type in properly planned nurseries. This will entail hand-picking of the cane and subjecting it to hot water treatment to achieve the desired quality. Although it will take at least four years to provide sufficient seedcane to satisfy all requirements, it is the only way to overcome the present dearth of good quality disease-free seed.

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