

# THE PERFORMANCE OF INTRODUCED VARIETIES AT PONGOLA

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## Abstract

A record has been made of the number of introduced varieties which have been screened annually at the Pongola Field Station since 1968. A brief description of their selection record has been given, and a comparison has been made between local and introduced clones at the various selection stages. Although varieties from other countries enter the selection programme at a relatively early stage, the results show that, as a group, they are inferior to the locally selected contemporaries in the same selection stage. Summarised results of the more promising overseas varieties tested are presented, together with those of the better locally selected clones.

## Introduction

As a matter of routine, varieties from other cane breeding countries are introduced through the quarantine facilities in Durban<sup>2</sup> for testing under South African conditions. Having completed their quarantine period, the varieties are planted into the observation trial stage of selection at the Pongola Field Station. The choice of Pongola as a preliminary screening site was based on the observation that introduced varieties tend to lack hardiness under South African conditions, and it was considered that the favourable growing conditions presented at Pongola would give the introduced varieties maximum opportunity to demonstrate any virtues.

Since plant breeding trials were first planted at Pongola, the number of clones entering this stage has steadily increased and today some 350 different varieties are tested annually. About 30 of these are cane varieties from other countries and the remaining 320 are derived from selections carried out at Pongola. In the first instance a selection is made from 45 000 single stools, at one year old, to give 3 200 single lines from which, after a plant crop harvest and ratoon assessment, the 320 local selections are made for the observation trial. Since the two groups are evaluated in the same trial, it presents an opportunity to compare the relative merits of our own selections with those from overseas, and at the same time to report on the performance of introduced varieties in this country. This has a more general interest than our own coded selections. It should be remembered that the introduced varieties are the terminal product of long selection programmes, whereas the seedlings in the observation trial are at a relatively early stage of selection.

## Results and discussion

### The 1968 group of introduced varieties

In 1968 planting of introduced varieties at Pongola was undertaken for the first time, since before this date such screening was carried out at the Umhlatuzi Valley Sugar Company environment site (UVS) or Shakaskraal farm. Since the Pongola field station had only just started, and there were no local seedling counterparts in the observation trial, this comprised 45 introduced varieties originating mainly from Canal Point and Hawaii. (Appendix I).

Mosaic disease was prevalent in the newly cleared areas at Pongola but, since then, the occurrence of this disease has been rare. Smut and leaf scald disease were common in the Canal Point and Hawaiian varieties, but eventually 13 were chosen for further testing in a primary variety trial. The yields obtained in this trial, averaged over three crops and expressed as a percentage of the NCo 376 control, are shown in Table 1.

TABLE 1

Primary variety trial results of the 1968 group of introduced varieties. Results are the mean of three crops

Rank	Variety	Mass ers as % of NCo 376	Ers % difference from NCo 376	Remarks
1	Co 740	106	1,9	
2	Pindar	95	2,2	Rust. Chlorotic gumming
3	H50/7209	94	2,1	Very severe smut
4	H39/723	92	0,3	Smut and leaf scald recorded
5	B49119	90	0,1	Smut recorded
6	CP29/166	87	-0,3	
7	CP51/21	87	2,7	
8	H32/8560	83	0,2	Smut and leaf scald recorded
9	H37/1933	82	1,3	Smut and gumming recorded
10	Q65	82	1,1	Leaf scald recorded
11	CP59/22	79	4,2	Smut and leaf scald recorded
12	H39/4753	72	-0,2	Smut recorded
13	Q68	70	-0,4	Smut and leaf scald recorded

From the results of this trial, B 49119, Co 740 and Pindar were advanced to regional trials, including retesting at Pongola. The overall results of these trials were poor, although Pindar again gave a creditable performance in its retest at Pongola, yielding 104% of NCo 376 over 3 crops. However, its susceptibility to gumming detracts from its usefulness in this area.

### The 1969 group of introduced varieties and the 67D series

The following year 41 imported varieties together with 65 clones selected from UVS, were planted in an observation trial. The introduced varieties generally compared unfavourably with the control variety, NCo 376, and, as a group yielded only 78% in terms of mass estimated recoverable sucrose (ers) of the control. However, ten introduced and 21 UVS selections were advanced to primary variety trial, and the summarized results of this trial are shown in Table 2.

TABLE 2

Primary variety trial results of 67D series and the 1969 group of introduced varieties. Results are the mean of three crops

Rank	Variety	Mass ers as % of NCo 376	Ers % difference from NCo 376	Remarks
1	67D 381	103	1,6	Smut susceptible
2	67D 372	98	1,4	Smut susceptible
3	Q76	98	0,4	Smut susceptible
4	Co 1001	97	1,9	Selected for further trial
5	67D 252	97	1,0	Slightly susceptible to smut
6	L60/25	96	2,5	Selected. susc. leaf scald
7	67D 430	95	1,1	Smut susceptible
8	67D 329	95	0,4	Smut susceptible
9	67D 442	94	0,9	Smut susceptible
10	67D 451	93	-0,3	Smut susceptible
11	CP57/526	93	1,2	Smut susceptible
12	CP61/39	93	2,7	Leaf scald susceptible
15	CP43/47	90	1,1	Leaf scald susceptible
18	Co 945	87	0,4	—
19	CP62/258	86	2,8	Gumming and smut suscep.
25	R447	80	-0,8	Smut susceptible
31	Mex 54/245	58	0,2	Mosaic susceptible

Note: Only local selections ranked in the first ten included. All introduced varieties shown.

Only Co 1001 survived the screening net, largely on account of its resistance to smut. This variety was very prone to lodging, but was pre-released for the northern smut-prone areas in 1975. However, a year later the occurrence of leaf scald in this variety led to the recommendation that further planting should be discontinued.

It is of interest to note that all but one of the 67D selections from UVS developed smut disease in this trial.

#### *The 1970 group of introduced varieties and the 68F series*

Thirty-seven introduced varieties in addition to 153 local selections of the 68F series were planted into observation trial in 1970. (Appendix 1). The 68F series were the first seedlings to be selected from single stools at Pongola, and were therefore of special interest. The 153 clones that were included in this trial were the surviving selections from 25 343 single stools which had, in turn, given rise to 1 676 single lines. As has been mentioned, nearly double this number of seedlings are now raised and selected annually at Pongola.

The observation trial gave rather variable results, but the introduced varieties, particularly those from Australia and Mauritius, appeared promising. Consequently, nearly half the overseas varieties were taken on to primary trial. As the results of this trial given in Table 3 show, the observation trial interpretation proved to have been optimistic and very few of the introduced varieties warranted further consideration.

Triton, Q58, and R397 were chosen for secondary trials, together with the locally selected clones. It was discovered that the variety 57NG155 was, in fact, the same as S17 and, since S17 was already being tested in advanced selection trials, there was no need to duplicate the variety.

At present very little information is available from secondary trials since the whole series was delayed by poor germination of the propagation plots at Mtunzini propagation farm. However, the indications are that both Triton and Q58 approach the yield of NCo 376 under fully irrigated conditions but fail dramatically where rainfed conditions are encountered. Triton appears to be rather susceptible to smut, having been recorded with the disease both here and in Rhodesia. R397 has proved to have rather a low sugar content and it has also been recorded with smut.

By comparison, several of the 68F series have outyielded the control although the top variety in the secondary trials 68F1467, has proved susceptible to smut.

#### *The 1971 group of introduced varieties and the 69F series*

In May 1971, 156 local selections of the 69F series, derived from 26 452 original stools, were planted with 27 introduced varieties at Pongola. The trial was harvested at 14 months of age in July 1972.

Table 4 shows the relative performance of the introduced and local selections expressed as a percentage of NCo 376. In order to make this comparison, the average yield of all the introduced varieties has been compared with the average yield of all local seedlings.

The superior performance of the local selections over the introduced varieties is clearly shown, although the relatively poor sugar content of the local selections may also be seen. This is perhaps not surprising since only one selection based on sugar content has been made by this stage.

It is noteworthy that NCo 310 has substantially outyielded NCo 376 in this trial, and, in trials planted in autumn, this has usually been the case. The reason appears to be the tardy germination of NCo 376 and, in the ratoon crops, NCo 376 generally equals or exceeds NCo 310.

TABLE 3

Primary variety trial results of 68F series and the 1970 group of introduced varieties. Results shown are the mean of three crops

Rank	Variety	Mass ers as % of NCo 376	Ers % difference from NCo 376	Remarks
1	Triton	102	0,6	Recorded with red rot. Rust susceptible
2	Q58	100	1,9	
3	68F1377	100	0,4	
4	68F1452	98	0,6	
5	68F1367	98	0,8	Severe smut
6	68F1467	98	0,4	Smut and rust susceptible
7	68F1091	97	-0,5	
8	68F1358	96	-1,8	
9	68F1517	95	0,0	
10	68F1370	94	-1,3	
13	R397	93	0,6	Slight smut
20	57NG 155	89	2,5	Smut and leaf scald recorded
28	M409/51	87	0,4	Smut recorded
29	M31/45	86	-0,2	Leaf scald recorded
30	CP55/30	85	0,5	Smut susceptible
31	Ebene 88/56	85	0,0	Smut susceptible
32	Vesta	84	-0,2	Smut recorded
36	M377/56	84	0,9	
48	Q47	77	0,2	
51	M351/57	75	-1,7	Gumming & mosaic recor'd
55	M305/49	74	0,9	
56	M13/56	73	-0,6	
65	M13/53	61	-0,4	
66	Co 608	61	-3,3	Smut and gumming recorded

Note: Results are given for all introduced varieties in the trial, but for local seedlings only those taken for further trial are considered.

TABLE 4

The relative performance of local seedlings and the 1971 group of introduced varieties in observation trial at Pongola

Variety/Group	Cane yield as % of NCo 376	Ers % difference from NCo 376	Mass ers as % of NCo 376
NCo 310	101	2,4	124
Seedlings. 69F Series	97	-0,6	91
Introduced varieties	82	0,3	83

On the results of this observation trial, nine introduced varieties and 55 clones of the 69F series were planted in a primary variety trial. The major reason for rejecting the imported varieties at this selection was poor performance, although B62138 was rejected because of leaf scald susceptibility and Q85 on account of its susceptibility to smut. Table 5 gives a summary of the primary trial results of this series.

On a basis of the plant cane results of the primary variety trial, four local seedlings and two introduced varieties were taken on to secondary variety trials in 1974, and the plant and first ratoon results are summarised in Table 6. In the primary variety trial a number of varieties improved their performance in the ratoon and, as a result, a further five local seedlings and one introduced variety were selected to secondary trial on their ratoon results.

Examining these results it may be seen that there is a considerable drop in yield between the poorest local seedling and the best introduced seedling Q86. It is of interest to note that, in the southern districts of Australia, where conditions of climate are probably more akin to our own, Q86 is the second most widely grown variety after NCo 310. A considerable amount of additional data are still to be collected on this series before the pre-release stage is reached but, at the present moment, it would appear that the local seedlings are the more promising.

TABLE 5

Primary variety trial results of 69F series and the 1971 group of introduced varieties. Results shown are the mean of three crops

Rank	Variety	Mass ers as % of NCo 376	Ers % difference from NCo 376	Remarks
1	69F775	111	0,7	Smut recor'd. Sus. to mosaic
2	69F1275	107	0,9	Very susceptible to mosaic
3	69F107	102	-0,2	Slight rust
4	69F187	102	-0,4	Susceptible to mosaic
5	69F1054	100	0,3	Very susceptible to smut
6	Q86	99	0,4	Susceptible to mosaic
7	69F607	98	1,8	Susceptible to mosaic
8	69F636	97	-0,6	Resistant to mosaic
9	69F1006	97	1,7	Smut and mosaic susceptible
10	69F353	97	0,4	Smut recorded
11	69F938	97	0,8	Smut recorded
12	69F179	96	0,3	Susceptible to mosaic
13	B52298	94	0,5	Resistant to mosaic
14	69F69	93	1,3	Mosaic susceptible
20	Q82	91	2,3	Severe rust and smut
21	CP61/37	90	1,7	Gumming recorded
28	Co 462	90	0,3	Good smut resistance in Rho.
29	Q84	88	1,4	Severe smut, severe rust
46	CP48/103	82	2,0	Severe rust
48	DB5/55	79	-0,8	Severe rust
64	Q81	74	0,6	Smut severe

TABLE 6

Secondary variety trial results of 69F series and the 1971 group of introduced varieties. The results are a mean of six crops

Rank	Variety	Ters as % of NCo 376	Ers % difference from NCo 376	Remarks
1	69F775	104	0,0	Tall heavy cane
2	69F187	97	0,0	
3	69F938	95	0,3	
4	69F1275	94	0,0	
5	Q86	86	1,1	
6	B52298	86	-0,3	Suspect leaf scald

*The 1972 group of introduced varieties and the 70F series*

A total of 288 clones, selected from an increased programme of 30 000 single stools, were planted with 12 introduced varieties in the 1972 observation trial.

As in previous years the relative performance of the local seedlings was superior to that of the introduced varieties, as separate groups. The averaged results are shown in Table 7.

TABLE 7

The relative performance of local seedlings and the 1972 groups of varieties in an observation trial at Pongola

Variety/Group	Cane yield as % of NCo 376	Ers % difference from NCo 376	Mass ers as % of NCo 376
NCo 310	109	0,1	110
Local seedlings (mean)	95	-0,7	88
Introduced varieties (mean)	70	0,3	72

The similarity between these results and those shown in Table 5 was striking, except that the 1972 group of introduced varieties appeared inferior to that of the previous year. The difference in the relative performance of NCo 310 is largely accounted for by the low sugar content obtained for the variety in this section of the trial.

A total of 68 local seedlings, and three introduced varieties were considered worthy of further testing in a primary variety trial. The results are shown in Table 8.

TABLE 8

Primary variety trial results of 70F series and the 1972 group of introduced varieties. The results shown are the mean of three crops

Rank	Variety	Mass ers as % of NCo 376	Ers % difference from NCo 376	Remarks
1	70F2201	106	0,9	Smut in all replications
2	70F983	106	1,9	
3	70F1326	105	1,2	
4	70F603	104	1,5	
5	70F1401	102	0,7	
6	70F42	102	1,2	
7	70F986	101	0,5	1 smut stool seen
25	Co 625	93	0,5	2 smut stools seen
38	P57/0497	87	-0,6	Smut in all replications
60	CP59/73	80	0,7	Smut in all replications

Note: 1. Only those local seedlings with a performance better than NCo 376 have been included. All introduced varieties in the trial are shown:

2. No introduced varieties taken to advanced trials.

These results confirmed the earlier suggestion that the introduced varieties in this series were rather poor. Among the local material there may be some possible varieties but, as the pre-release stage for this series will not be reached until 1981, at the earliest, it would be unwise to speculate.

*The 1973 group of introduced varieties and the 71F series*

This trial, planted in 1973, comprised 27 introduced varieties and 207 seedlings from the 71F series. When the average yields of the introduced and local varieties were compared the local selections were superior.

TABLE 9

The relative performance of local seedlings and the 1973 groups of varieties in an observation trial at Pongola

Variety/Group	Cane yield as % of NCo 376	Ers % difference from NCo 376	Mass ers as % of NCo 376
NCo 310	90	0,5	95
Seedlings (mean)	86	-0,4	83
Introduced varieties	71	0,3	73

On a basis of the observation plot trial results, six introduced and 57 local selections were advanced to a primary variety trial.

The five introduced varieties were Co 851, F156, L62/96, M253/48, Inyati, Phil 54/64. With the exception of M253/48 and Inyati, all the introduced varieties have proved susceptible to smut and/or leaf scald. Inyati, which was at one time thought to be a smut-resistant mutant of NCo 310, developed smut at both Pongola and the Mtunzini propagation farm, and there is now no reason to believe that it is not merely NCo 310.

M253/48 has yielded very well in a variety trial at Pongola, but unfortunately lodges extremely badly; nevertheless it has been advanced to secondary trial and further results are awaited.

There are several promising local selections in the 71F series although many of the clones have proved susceptible to leaf scald.

*The 1974 group of introduced varieties and the 72F series*

In 1974, 42 introduced varieties were planted together with 301 local selections. As in previous years the local selections as a group performed better than the introduced varieties. Of the imported varieties, 13 were taken to primary variety trial and, at present, only the plant crop result is available.

The varieties selected for the variety trial were:— CB 40/35, CB 40/69, Co 281, Co 411, Co 527, Co 650, Co 997, Cp 36/191, CP 51/24, CP 56/59, F138, M356/53, M442/51. In the plant crop CB 40/35 and F138 have equalled or been better than the NCo 376 control. Unfortunately F138 has proved susceptible to leaf scald.

