

THE POTENTIAL OF THREE NEW SUGARCANE VARIETIES RELEASED FOR USE IN THE SOUTH-EAST LOWVELD OF ZIMBABWE

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Abstract

Three new varieties have been released by the Zimbabwe Sugar Association Experiment Station (ZSAES). Varieties 79-2343 and 79-3275 originate in Zimbabwe and have been selected from crosses made in the South African Sugar Association Experiment Station (SASEX) crossing programme in 1977. Variety 79-2343 (ZN1L) is recommended for harvesting in the late season, whereas 79-3275 (ZN2E) is recommended for early season harvesting. CP72-1312 from Canal Point, USA, is recommended for harvesting throughout the year. All three varieties have high resistance to smut, leaf scald and other important diseases in the region.

Keywords: varieties, early, late, resistance

Introduction

The ZSAES breeding programme was initiated in 1976 in collaboration with SASEX. The aim is to produce varieties more productive and resistant to diseases, especially smut, than NCo376, the standard variety grown. Seed of 100 crosses is provided by SASEX each year, and seedlings of these crosses are grown and screened under local conditions at ZSAES and on three estates.

Three varieties have been released on the basis of their potential realised in replicated yield and disease trials conducted between 1982 and 1992. Early season harvested crops are cut from mill opening in April to August, and late harvested crops are cut from September to November. The early season harvested crops are characterised by low sucrose content which responds to chemical ripening to improve the ERC % cane. No ripeners are recommended for late season crops as the ERC % cane is generally high in Zimbabwe when these are harvested.

The varieties from the ZSAES selection programme will be named ZN1L and ZN2E for 79-2343 and 79-3275 respectively. The 'Z' will stand for Zimbabwe, 'N' for Natal, '1' for the first variety released from our selections and 'L' and 'E' stand for late and early season harvesting respectively.

Materials and methods

The varieties were tested in replicated advanced and pre-release variety trials up to the third ratoon crop. Two advanced variety trials (AVTs) were established in the early and late seasons at ZSAES and pre-release variety trials (PRVTs) were established at four sites (ZSAES, Hippo Valley, Triangle and Mkwasi estates) in April. The ZSAES, Mkwasi and Triangle sites were on sandy clay loam soils, and the Hippo Valley site was on basalt clay.

The early season AVT and PRVTs received 120 kg/ha/annum nitrogen in the plant crops and plant crops in late season trials received 140 kg N/ha/annum. All ratoon crops received

180 kg N/ha/annum nitrogen. All nitrogen was applied in the form of ammonium nitrate as a split application. Plant and ratoon crops received 100 and 60 kg/ha/annum P₂O₅ of single superphosphate respectively. Muriate of potash was applied at 60 kg/ha/annum K₂O in all trials.

The early and late season trials were harvested at 12 months of age, whereas the PRVTs were harvested at 14 months of age. Cane weights, stalk counts, lodging and flowering estimates were recorded at harvest. Sucrose was analysed on a 24 stalk sample at harvest. Smut and other diseases were recorded until harvest or until lodging prevented access to plots.

Single-eyed setts from varieties CP72-1312, ZN1L and ZN2E were hot water treated for two hours at 50°C to test their sensitivity to the heat treatment used to control ratoon stunting disease.

Results

ZN1L (79-2343): Late season variety

The variety was selected from the ZSAES breeding programme as a seedling of a cross between 68F1467 and several unknown male varieties which was obtained from SASEX in 1977.

Table 1 shows that ZN1L produced on average 5% more cane than NCo376 in all trials. Sucrose content was generally similar to that of NCo376 except in the early season harvested plant crops, when it was 0,8 unit lower. The sucrose content of this variety was 0,5 unit higher than NCo376 in the late season harvested crops with up to 7% more tons sugar than NCo376. The variety is therefore recommended for late season harvesting. Variety ZN1L produced similar sugar yields to NCo376 in the early crops. Early harvested crops, and especially plant crops, should benefit from chemical ripeners to improve ERC % cane. The ERC % cane in early harvested crops was 0,8 unit lower than NCo376 although cane yield was higher than NCo376.

Table 1
Summary of performance for variety ZN1L (27 crops)

Yield	Harvesting period					
	All year		Early		Late	
	ZN1L	NCo376	ZN1L	NCo376	ZN1L	NCo376
Cane (t/ha)	156	149	182	169	145	141
ERC % cane	13,4	13,3	12,3	13,1	13,9	13,4
ERC (t/ha)	20,7	19,8	22,3	22,1	20,1	18,8
Fibre %	13,5	14,3	11,2	11,9	14,3	15,1
Stalks/ha x 10 ⁻³	130	149	126	137	131	155

Variety ZN1L exhibited very high smut resistance. Only three smut whips were recorded in trials comprising 27 crops.

It remained free of smut in smut susceptibility trials. This variety was also very highly resistant to leaf scald disease.

Variety ZN1L flowered less, but lodged more, than NCo376. It contained 0,8 unit lower fibre than NCo376 and averaged 130 000 millable stalks per hectare compared with 149 000 for NCo376. The germination of ZN1L is lower than that of NCo376 when hot water treated.

ZN2E (79-3275): Early season variety

This variety was selected from the ZSAES breeding programme as a seedling of a cross between 70F2155 and CB40/35 obtained from SASEX in 1977.

Variety ZN2E consistently yielded 10% less cane than NCo376 in replicated trials (Table 2). This variety produced very high sucrose content, which averaged 1,5 units higher than NCo376. Variety ZN2E recorded a higher sucrose content in early season harvested crops where its ERC % cane averaged 1,8 units higher than NCo376. It produced 4% more sugar than NCo376 in the early harvested crops, and similar sugar yields to NCo376 in the late season harvests. The variety is recommended for early season harvesting.

Variety ZN2E will be more economic to transport to the mill because it produces 10% less cane/ha but 12% more sugar per ton of cane than does NCo376. It should be particularly attractive to growers situated far away from the mill with high transport costs. Mill recovery might also be improved with variety ZN2E because of its high sucrose content and lower fibre. Its high sucrose content in the early harvested crops may reduce the need for ripening.

Variety ZN2E was resistant to smut. It produced no smut whips in 15 out of 26 crops. The variety rarely flowered in the trials but was more susceptible to lodging than NCo376. This variety produced 2,0 units less fibre than NCo376. It averaged 122 000 stalks per hectare, whereas NCo376 produced 145 000. Germination of ZN2E is lower than that of NCo376 when hot water treated.

Table 2
Summary of performance for variety ZN2E (26 crops)

Yield	Harvesting period					
	All year		Early		Late	
	ZN2E	NCo376	ZN2E	NCo376	ZN2E	NCo376
Cane (t/ha)	137	149	152	167	123	134
ERC % cane	14,6	13,1	14,2	12,4	15,0	13,7
ERC (t/ha)	19,7	19,3	21,3	20,6	18,4	18,3
Fibre %	10,8	12,8	10,2	11,6	11,4	14,2
Stalks/ha x 10 ⁻³	122	145	119	136	124	153

CP72-1312: All year harvesting

This variety was imported from Canal Point, USA, as a selection from the cross CP65-357 x CP56-63. The variety produced high cane yields and ratooned well in Florida (Machado, 1994).

Cane yields and sucrose contents were higher than NCo376 throughout the year (Table 3). Variety CP72-1312 produced 4% more cane and 1,0 unit higher sucrose content than NCo376. It flowered less than NCo376, but was more susceptible to lodging. It recorded 0,8 unit higher fibre than NCo376. Its stalk population averaged 118 000 per hectare compared with 145 000 from NCo376. CP72-1312 germinated better than NCo376 when hot water treated.

Variety CP72-1312 was more resistant to smut than NCo376 although its level of resistance was lower than that of the ZN varieties. It was also resistant to leaf scald.

Rating the trial varieties

Table 4 gives the disease rating and percentage flowering and lodging of the three newly released varieties compared with NCo376. Disease rating was done on a scale of one to nine, where 1 = highly resistant, 5 = intermediate and 9 = highly susceptible.

Table 3
Summary of performance for variety CP72-1312 (19 crops)

Yield	Harvesting period					
	All year		Early		Late	
	CP72	NCo376	CP72	NCo376	CP72	NCo376
Cane (t/ha)	147	141	155	148	133	129
ERC % cane	14,3	13,3	14,1	13,1	14,7	13,7
ERC (t/ha)	21,1	18,6	21,9	19,2	19,7	17,6
Fibre %	12,8	12,0	12,8	11,8	13,2	12,9
Stalks/ha x 10 ⁻³	118	145	113	141	126	152

Table 4
Disease rating, flowering and lodging of the newly released varieties compared with NCo376

Variety	Number of crops	Smut rating	Leaf scald rating	Flowering (%)	Lodging (%)
ZN1L	27	1	1	9	83
ZN2E	26	3	5	3	74
CP72-1312	19	5	2	13	59

Scale of disease rating: 1 = highly resistant; 5 = intermediate; 9 = highly susceptible

Discussion

The release of these three varieties increases the choice of varieties available to the Zimbabwe sugar industry. Improved profitability can be realised when these varieties are grown within their recommended planting and harvesting periods. High early season sucrose contents may reduce the need for chemical ripening in early harvested crops, and thus reduce costs. Difficulties in application currently limit the use of ripeners in Zimbabwe.

Growers situated a long distance from the mill should grow ZN2E, the high sucrose early season variety, as it would prove to be more economic to transport (less cane to mill and higher sugar content).

These new varieties are resistant to smut and this should reduce the cost of roguing for smut control in the industry. Even if smut roguing is to be done at the same frequency as with NCo376, there will be fewer smut whips being removed and so a bigger area can be inspected in a given time. This would reduce the labour required for roguing. The costs of more frequent plough-outs and replantings as a result of high smut infection should also be reduced when farmers grow these new varieties.

It may also be possible to hot water treat seedcane of these varieties to control ratoon stunting disease without the risk of high smut infection. Hot water treatment increases smut infection in NCo376. Hot water treatment of these varieties may reduce loss in yield from ratoon stunting disease. The number

of ratoons per crop cycle may be increased, and this may improve profitability of sugar production since it is cheaper to maintain ratoons than to establish plant crops. This aspect might need to be investigated.

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