

SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

Cat. No.: 1364

6400/25(a) MAXIMUM YIELD TRIAL

Object: To obtain the maximum yield of cane from 12 month old ratoon NCo 376 harvested at 2 times of year, viz. early May and late November, through a balanced supply of luxury levels of all nutrients and a non-limiting moisture regime.

This Crop: First ratoon. Age: 12,1 months (4.5.81-7.5.82)

Location: ZSA Experiment Station - Block F.1

Soil Type: PE.1 sandy clay loam derived from gneiss.

Design: No statistical lay-out, 3 replications.

Variety/Spacing: NCo 376 in 1,5 m rows.

Treatments: Control: (0): Standard fertiliser practice (kg/ha)

$\frac{N}{180}$	$\frac{P_2O_5}{100}$	$\frac{K_2O}{60}$
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Treated: (1): Luxury levels (kg/ha) applied in addition to control:

$\frac{N}{120}$	$\frac{P_2O_5}{50}$	$\frac{K_2O}{120}$
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20 kg N/ha and 20 kg K₂O/ha applied at 4 weekly intervals from 20 weeks to 40 weeks inclusive. 50 kg P₂O₅/ha applied at 20 weeks.

Rainfall: 469,9 mm

Irrigation: Overhead at 40 mm (nett) deficit: 1 436,5 mm.

RESULTS:

Relevant harvest data from the first crop cycle (1R) and presented in the attached table.

Cane Yields: Luxury levels of all fertilisers boosted cane yields by 7,61% over the control.

Sucrose quality: Quality measured in terms of sucrose was badly affected by higher fertiliser levels. ERC % cane was depressed by 13,14% while Pol % cane was depressed by 11,27% with respect to control.

Fermentable quality: Fermentable quality parameters were not as adversely affected by luxury fertiliser levels. ERF % cane was depressed by 8,57% and TFAS % cane by 8,34% relative to control. Reducing sugars were considerably higher in treated plots (144,0% over control).

ERC Yields: Increased cane yields were not sufficient to counteract the adverse effects of higher fertiliser levels and treated plots showed a 6,5% decline in yield of recoverable crystal.

ERF Yields: Luxury fertiliser levels depressed the fermentable yield by only 1,60% relative to control, which is considerably less than was

experienced by crystal yield. This difference was due to increased RS % cane in treated plots, but as RS constitute such a small proportion of the total sugars this increase was not sufficient to raise treated fermentable yield above control.

CONCLUSIONS:

Results followed previously reported patterns in that high nitrogen levels depressed quality parameters appreciably, and also fermentable quality was less affected than sucrose quality.

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RESULTS:

		Control	Treated	% of Control
Yield	Cane Yield	140,37	151,05	107,61
Data	ERC Yield	16,32	15,26	93,50
t/ha	ERF Yield	18,16	17,87	98,40
Quality	Pol	12,96	11,50	88,73
Analysis	TFAS	13,67	12,53	91,66
Data	ERC	11,64	10,11	86,86
%	ERF	12,95	11,84	91,43
Cane	RS	0,75	1,08	144,00
Stalk population/ha x 10 ³		156,8	162,6	103,70
Stalk lengths m		2,32	2,62	112,93

JJR/July '82

6400/25 MAXIMUM YIELD TRIAL

TERMINAL REPORT

Cat.: 1364
Object: To determine whether cane yields could be boosted by the application of high fertiliser levels so as to increase the yield of total fermentable sugars for ethanol production.

Planted: The trial site was originally planted on 15th December, 1978 as a chemical ripener trial (7310/8) which was terminated in 1980. Selected areas were cut back in May and November 1981 and treatments were subsequently imposed for 6400/25.

Terminated: The early-season trial in 1982 after one crop, and the late-season trial in 1983 after two crops.

<u>Harvest dates and ages:</u>	<u>Harvest</u>	<u>Age</u>
Early season trial:	7. 5.82	12,1 months
Late season trial:	18.11.82	11,6 months
" " "	21.11.83	12,1 months

Location: ZSA Experiment Station, Impala Block F1 to F3.

Soil type: PE.1 sandy clay loam derived from gneiss.

Design: Non-statistical, 3 replications.

Variety/spacing: NCo 376, in 1,5m rows.

<u>Irrigation and rainfall:</u>	<u>Irrig.(mm)</u>	<u>Rain(mm)</u>
Early trial 1981/2	1 437	470
Late trial 1981/2	1 246	392
Late trial 1982/3	1 451	359

Treatments: A comparison was made between standard fertiliser practice and the application of high levels of fertiliser as follows:

Control (Standard practice) : 180 kg/ha N applied in two equal dressings at 4 and 8 weeks; 100 kg/ha P₂O₅ at 4 weeks; 60 kg/ha K₂O at 4 weeks.

Luxury levels: The following fertiliser was applied in addition to the control:
 120 kg/ha N and 120 kg/ha K₂O applied in six applications of 20 kg/ha each at 4-week intervals from 20 to 40 weeks.
 50 kg/ha P₂O₅ applied at 20 weeks.

RESULTS

Relevant data for the early and late-season trials in 1982, and the additional late-season harvest in 1983, are presented in the attached table.

1. Early season responses (1982). The luxury fertiliser regime produced a small cane yield response, but the advantage of this was offset by low percentages of sucrose and of fermentables so that ERC and ERF yields were slightly lower than those produced with standard fertiliser practice.

There was a marked increase in reducing sugars (RS % cane) with high fertiliser rates, with the result that ERF (estimated recoverable fermentables) yields were less severely depressed than ERC yields. The increased cane yield produced by the high fertiliser regime was associated with increased stalk populations and significantly longer stalks.

2. Late-season responses (1982). There were no major yield or quality differences between the two treatments except for increased reducing sugars in the high fertiliser plots.
3. Late-season responses (1983). Yields were severely affected by the drought in spite of uninterrupted irrigation schedules, largely because of uneven growth caused by poor sprinkler distribution in a season with little supplementary rainfall. Under such conditions it was not expected that high fertiliser levels would give positive yield and quality responses, but it was surprising that they caused consistently lower values (with the exception of RS % cane).

CONCLUSIONS

The results of these exploratory trials indicated that economic ERC and ERF yield responses cannot be expected from the application of high fertiliser rates to either early or late-season cane.

In 1983 the early-season trial was modified to study the added effect of chemical ripeners, and results have been reported separately (6400/26).

KEC/Dec'83

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6400/25

MAXIMUM YIELD TRIAL

YIELD AND QUALITY DATA

Trial and Treatment	YIELD DATA			QUALITY DATA (% CANE)					STALK DATA	
	CANE t/ha	ERC t/ha	ERF t/ha	Po1 %	ERC %	TF %	ERF %	RS %	Stalks/ha x 10 ⁻³	length (m)
<u>Early trial 1982</u>										
Standard fertiliser	140,37	16,32	18,16	12,96	11,64	13,67	12,95	0,75	156,8	2,32
Luxury fertiliser	151,05	15,26	17,87	11,50	10,11	12,53	11,84	1,08	162,6	2,62
Luxury % standard	107,61	93,50	98,40	88,73	86,86	91,66	91,43	144,00	103,7	112,93
<u>Late trial 1982</u>										
Standard fertiliser	120,18	14,74	16,11	13,82	12,28	14,27	13,40	0,47	199,4	2,25
Luxury fertiliser	123,61	14,93	16,81	13,82	12,12	14,46	13,63	0,68	195,1	2,18
Luxury % standard	102,85	101,43	104,35	100,00	98,70	101,33	101,72	144,68	97,8	96,89
<u>Late trial 1983</u>										
Standard fertiliser	85,86	10,96	12,00	14,30	12,75	14,86	13,96	0,59	190,1	2,26
Luxury fertiliser	79,06	9,78	10,96	14,03	12,34	14,73	13,85	0,74	176,5	2,08
Luxury % standard	92,08	89,23	91,33	98,11	96,78	99,13	99,21	125,42	92,9	92,04