SUGARCANE VARIETIES SUITABLE FOR SANDY SOILS IN MPUMALANGA

SPAULL V W[1], CADET P[2] and BERRY S[1]

[1]*South African Sugarcane Research Institute, Private Bag X02, Mount Edgecombe, 4300, South Africa* Vaughan.spaull@sugar.org.za

[2]*Institute of Research for Development (IRD), Paris, France.* cadetpatrice@free.fr

Abstract

Yields were recorded from the plant crop and four ratoons of eight sugarcane varieties in an early season and a late season nematicide trial under drip irrigation on a sandy soil in Mpumalanga. The better varieties in the early season trial were N14, N25, N28 and N32, and N14, N25 and N32 in the late season trial. Without a nematicide, planting and harvesting in autumn, rather than late season, conferred an average 1.5 t estimated recoverable crystal (ERC) yield advantage for the eight varieties. There was no such advantage when the crops were treated with a nematicide. Average per cent response to nematicide treatment in crops cut on a late season cycle was twice that of the response in the early season cycle. Response to treatment was least in N14. ERC % cane, averaged over all varieties, was not influenced by the cutting cycle. Confining the time of planting and ratooning of sugarcane grown on sandy soils to the early part of the season would reduce the yield loss caused by nematodes.

Keywords: harvest season, nematicides, nematode management, sugarcane varieties, yield

Introduction

Most soils in the northern irrigated region of the South African sugar industry have a relatively high clay content and are not considered to be a problem as far as nematodes are concerned. However, there are areas of sandy soils where nematodes are a constraint to sugarcane production. As in other regions of the sugar industry nematodes can be managed, not only with nematicides, but also with the appropriate choice of varieties. This was demonstrated with data from the plant crop and two ratoons of two variety x nematicide trials in Mpumalanga (Spaull and Cadet, 2003). Judging from the smaller response to treatment with nematicide it was concluded that variety N14, with an average response of 8%, was more tolerant of nematodes than varieties N19, N26 and N30, each with an average response of about 30%. The more tolerant varieties were those that produced the higher yields. These same two variety x nematicide trials in Mpumalanga were continued through to the end of the fourth ratoon and data from the five crops are used here to measure the benefit of using a nematicide on sugarcane on a sandy soil under drip irrigation and to identify the most suitable varieties for this environment. The trials were close to each other and planted at contrasting times of the harvesting season so enabling an assessment to be made of the effect of season on varietal performance.

Materials and methods

The two trials, each comprising the plant crop and the following four ratoons, were established on the farm 'Richtershoek' of Mr F Potgieter in Tonga, Mpumalanga. In each trial eight varieties, N14, N19, N23, N25, N26, N28, N30 and N32, were planted with and without the carbamate nematicide, aldicarb (Temik 150G). The soil in both trials was a sandy

Fernwood series changing towards a Longlands. One of the trials was planted and harvested in autumn (early season), and the other in spring (late season), (Table 1). Each trial was arranged as split, nematicide-treated and untreated plots in randomised blocks, replicated six times. Four of the replicates of the early season trial were adjacent to the late season trial site. The remaining two replicates were situated on a similar soil approximately 500m away. The nematicide was applied at 3 kg active ingredient/ha in the furrow, at planting, and again at the same rate, over the row, within four weeks after the previous crop was harvested for each of the following four ratoons. Each plot comprised 5 rows x 8 m with a 1.5 m row spacing. Irrigation was applied through dripper lines, one per row, during a 2-hour period each day to give 8 mm of water per day. Allowance was made for rainfall. The plant crop was fertilised with 400 kg per hectare of Atlas Fertilizer Co's Guanophos (3.7%N, 10%P, 1.3%K) with high sulphur and high calcium, in the furrow, followed by a top dressing of 400 kg 10-1-10. The ratoon crops received 680 kg 5-1-5 NPK per hectare. Weeds were controlled with a mixture of Sencor and Diuron.

At harvest the cane leaves were burnt and the stalks in the centre three rows of each plot were cut and weighed and a 12-stalk sample analysed for moisture and fibre content and estimated recoverable crystal (ERC). ERC is the measure used by the industry to estimate the amount of sucrose in cane that will be recovered as sugar. Data for eight of the plots of the 1st ratoon of the early season trial and for 22 of the plots of the 1st ratoon of the late season trial were lost when the plots were inadvertently cut and the stalks mixed. For analysis the average of the remaining plots of the same treatment was used in place of the missing data. Crop duration differed between the early season and late season trials, so before making comparisons between trials the data were converted to the yield per annum. Yield data, tons cane and tons ERC, and % ERC content, per crop, were subjected to an analysis of variance.

Table 1. Details of the trial sites.

Crop	Early Season				Late Season			
	Date crop began (age at harvest in months)			Rainfall per crop (mm)	Date crop began (age at harvest in months)			Rainfall per crop (mm)
Plant crop	21 Apr 1999 (12.6)			1702	2 Dec 1998 (11.9)			1111
1st ratoon	9 May 2000 (12.0)			903	29 Nov 1999 (11.2)			1591
2nd ratoon	8 May 2001 (12.5)			1073	6 Nov 2000 (12.2)			884
3rd ratoon	22 May 2002 (11.9)			532	13 Nov 2001 (11.7)			584
4th ratoon	19 May 2003 (12.6)			920	5 Nov 2002 (12.0)			363
Average	12.3 months			1026	11.8 months			907
Soil texture	% clay 7.6	% silt 4.5	% sand 87.9		% clay 4.9	% silt 5.3	% sand 89.8	

Results

The common nematode species in both trials were *Meloidogyne javanica, Pratylenchus zeae, Xiphinema elongatum* and species of *Paratrichodorus* and *Tylenchorhynchus* ([1]unpublished data).

[1] VW Spaull (2005), South African Sugarcane Research Institute, Mount Edgecombe, South Africa.

Cane yield

Early season trials

In the early season plant crop good yields were obtained from N14, N19, N25, N28 and N32, whether treated with nematicide or not (Table 2). In the subsequent ratoon crops yields were lower but N14, N23, N25 and N32, with or without treatment, were the better varieties. Varieties N26 and N30 performed poorly. Averaged over the five crops, the better yielding varieties, with or without nematicide treatment, and based on yields per annum, were N14, N25 and N32 (Table 3; $P<0.05$). Treated with nematicide, N28 also performed well.

Late season trials

In the plant crop of the late season trial better yields were achieved with N14 and N25 whether treated with a nematicide or not (Table 2). Nematicide treated N19 and N32 also produced high yields. As with the early season trial yield of ratoon crops declined over time, with N25 the higher yielding variety. Based on yield per annum, averaged over the five crops, the better varieties in the late season trial, when not treated with a nematicide were N14 and N25 (Table 3; $P<0.05$). When a nematicide was used the best varieties were N25 and N32 ($P<0.05$).

With or without nematicide treatment, the yield of cane, averaged over the eight varieties, was correlated with rainfall in both the early season trial ($R^2>0.7$) and the late season trial ($R^2>0.6$).

ERC% cane

The ERC% cane of N30 was significantly higher than most other varieties in all the crops for both early and late season cycles (Table 4; $P<0.05$). Other varieties with above average ERC% cane were N19 and N26 in both trials, and N32 in the late season trial. In both trials, ERC% cane was lower in the plant and first ratoon crops than in the second to fourth ratoons (Table 4).

ERC yield

With or without nematicide treatment, the varieties with the higher ERC yields in the plant crop were N19, N30 and N32 in both trials, together with N14 and N25 in the late season trial (Table 5; $P<0.05$). In the ratoon crops the more consistent and higher yielding varieties were N14, N23, N25 and N32 in the early season trial, and N25 in the late season trial. Based on yield per annum and averaged over the five crops, only N26 and N30 had significantly lower yields compared with N25, the best yielding variety (Table 3; $P<0.05$). The better late season varieties, without nematicide treatment, were N14, N25 and N32, and N19, N25 and N32 with nematicide (Table 3; $P<0.05$).

Early season versus late season

Except for N26 and N30, the yield, in tons cane and tons ERC, of most of the varieties was greater in the early season trial than the late season trial (Tables 2 and 5). The benefit derived from planting and ratooning on an early season cycle was generally greater for the untreated controls than for the nematicide treated cane (Table 3). The ERC content of the cane in the early and late season trials was similar (Table 4).

Response to treatment with nematicide

In the early season trial none of the varieties showed a significant response, in tons cane, to treatment with the nematicide (Table 2). However, a response in tons ERC was recorded in the plant crop of five of the varieties in this trial, N19, N23, N26, N30 and N32, and in N30 in the second ratoon (Table 5; P<0.05). There were many more occasions when a significant response to treatment was recorded in the late season trial, both in tons cane and tons ERC (Tables 2 and 5). The response to nematicide treatment on yield of cane and ERC was greater in the late than the early season trial, especially for varieties N19, N30 and N32 (Table 3). Overall, the response to treatment in the late season cycle was twice that for the early season. Except for N26 and N30, there was a noteworthy yield benefit, in both tons cane and tons ERC, from cutting the untreated cane on an early season cycle (Table 3). Where a nematicide was used this benefit was smaller.

Moisture and fibre content

The moisture content tended to be higher and the fibre content lower in cane cut early season (Table 6). Treatment with nematicide did not appear to influence this relationship.

Table 2. Cane yield in the plant crop (plant) and from the first (1R) to the fourth ratoon (4R), per variety, with and without treatment with a nematicide, for the early season and late season trials. (C = control; T = treated with nematicide)

	Early season Cane tons/ha						Late season Cane tons/ha					
Variety	Plant	1R	2R	3R	4R	**Mean**	Plant	1R	2R	3R	4R	**Mean**
N14 C	155.2[a]	98.6	118.6	88.2	87.4	**109.6**	146.9	94.7	83.3	55.9	48.1	**85.8**
N14 T	174.1	118.9	118.4	83.1	72.0	**113.3**	148.0	103.6	94.1	91.2*	58.1	**99.0**
N19 C	134.1	74.7	68.5	69.0	63.9	**82.0**	106.4	75.6	66.1	43.2	39.3	**66.1**
N19 T	170.3	74.1	91.2	65.5	65.4	**93.3**	132.8*	103.8*	110.8*	86.5*	55.6	**97.9**
N23 C	109.4	96.0	104.7	80.1	71.3	**92.3**	96.2	74.4	83.9	62.9	51.2	**73.7**
N23 T	144.5	105.2	118.3	80.2	83.8	**106.4**	123.3*	91.4*	93.5	91.0*	55.3	**90.9**
N25 C	158.3	130.0	123.3	98.0	90.7	**120.1**	128.9	117.5	109.4	70.7	60.6	**97.4**
N25 T	166.0	146.5	145.5	100.2	90.1	**129.7**	137.5	144.1*	138.1*	102.0*	65.8	**117.5**
N26 C	85.6	45.2	56.0	51.0	42.4	**56.0**	94.8	59.2	51.6	35.5	28.2	**53.9**
N26 T	116.1	64.1	72.1	54.1	55.7	**72.4**	97.7	69.6	86.5*	73.9*	38.0	**73.1**
N28 C	151.2	87.8	105.2	63.0	65.1	**94.5**	110.3	83.1	83.0	61.8	49.6	**77.6**
N28 T	169.5	102.6	123.1	73.3	73.8	**108.4**	122.3	91.3	101.6*	88.6*	49.5	**90.7**
N30 C	108.6	46.5	45.2	43.1	47.3	**58.1**	101.8	62.5	49.8	39.4	33.7	**57.4**
N30 T	137.3	60.5	66.9	41.0	42.3	**69.6**	119.4	73.1	85.0*	73.2*	50.8*	**80.3**
N32 C	159.4	116.2	110.0	85.9	67.6	**107.8**	120.6	100.8	73.0	54.9	38.8	**77.6**
N32 T	189.5	131.7	124.8	92.6	67.9	**121.3**	131.4	137.8*	113.8*	90.4*	60.3*	**106.7**
SED	20.5	18.1	14.0	12.6	11.0		9.9	6.3	7.8	5.5	8.1	
LSD05	41.4	36.5	28.2	25.5	22.2		20.0	12.8	15.7	11.1	16.3	

[a]The higher yields per crop and per treatment that are not significantly different from one another are underlined (P<0.05).

*Cane yield significantly greater than the untreated control (P<0.05).

Table 3. Yield per annum and response to nematicide treatment in the early and late season trials, averaged over the five crops, together with the benefit of the early season cycle compared with the late season cycle. Varieties are listed according to the yield of the untreated controls.

Variety	Trial	Tons cane/ha/annum Control	Tons cane/ha/annum Nematicide	% response to nematicide	% benefit of early cycle Control	% benefit of early cycle Nematicide
N25	Early	116.89 a*	126.22 a	8.0		
N14	Early	106.49 ab	110.14 ab	3.4		
N32	Early	104.93 abc	118.01 ab	12.5		
N28	Early	91.66 bcd	105.26 abc	14.8		
N23	Early	89.87 bcd	103.41 bc	15.1		
N19	Early	79.71 d	90.46 c	13.5**		
N30	Early	56.37 e	67.43 d	19.6		
N26	Early	54.44 e	70.29 d	29.1		
N25	Late	99.33 a	119.86 a	20.7**	17.7	5.3
N14	Late	87.39 ab	100.87 b	15.4	21.9	9.2
N32	Late	79.33 b	109.01 ab	37.4**	32.3	8.2
N28	Late	78.98 b	92.30 bc	16.9	16.1	14
N23	Late	75.01 b	92.59 bc	23.4**	19.8	11.7
N19	Late	67.35 bc	99.70 b	48.0**	18.3	-9.3
N30	Late	58.54 c	81.65 c	39.5**	-3.7	-17.4
N26	Late	54.90 c	74.39 c	35.5**	-0.8	-5.5
Mean	**Early**	**87.5**	**98.9**	**14.5**	**15.2**	**2.0**
Mean	**Late**	**75.1**	**96.3**	**29.6**		

Variety	Trial	Tons ERC/ha/annum Control	Tons ERC/ha/annum Nematicide	% response to nematicide	% benefit of early cycle Control	% benefit of early cycle Nematicide
N25	Early	13.74 a	15.39 a	12.1		
N32	Early	13.34 a	15.19 a	13.9		
N14	Early	12.70 a	12.70 ab	0.1		
N28	Early	11.38 ab	13.18 ab	15.8		
N23	Early	11.05 ab	12.64 abc	14.3		
N19	Early	10.84 ab	12.47 abc	15.1		
N30	Early	8.52 bc	10.33 bc	21.2		
N26	Early	7.72 c	9.73 c	26		
N25	Late	12.40 a	15.77 a	27.2**	10.8	-2.4
N32	Late	10.72 ab	14.86 a	38.7**	24.4	2.2
N14	Late	10.34 abc	12.52 bc	21.1	22.8	1.5
N28	Late	9.71 bcd	11.72 bc	20.7	17.2	12.5
N23	Late	9.17 cd	11.31 c	23.2	20.5	11.8
N19	Late	9.09 cd	13.78 ab	51.5**	19.2	-9.5
N30	Late	8.82 cd	12.45 bc	41.2**	-3.4	-17
N26	Late	7.57 d	10.33 c	36.6**	2.1	-5.9
Mean	**Early**	**11.2**	**12.7**	**14.8**	**14.2**	**-0.9**
Mean	**Late**	**9.7**	**12.8**	**32.5**		

*Within treatments and within the early and late season trials numbers followed by the same letter are not significantly different (P<0.05).

**Significant response to treatment with nematicide.

Table 4. % ERC for the plant crop (plant) and from the first (1R) to the fourth ratoon (4R), per variety, with and without treatment with a nematicide, for the early season and late season trials. (C = control; T = treated with nematicide).

	Early season ERC % cane						Late season ERC % cane					
Variety	Plant	1R	2R	3R	4R	**Mean**	Plant	1R	2R	3R	4R	**Mean**
N14 C	10.1	12.0	12.8	12.2	14.0	**12.2**	11.3	10.6	12.6	12.2	13.5	**12.0**
N14 T	9.8	11.7	12.3	12.7	13.3	**12.0**	12.1	11.1	12.7	13.0	14.2	**12.6**
N19 C	12.1	[a]13.3	15.1	14.0	14.7	**13.8**	12.9	12.5	14.6	14.1	14.8	**13.8**
N19 T	12.8	13.3	15.1	13.7	14.7	**13.9**	12.8	12.8	15.3	14.0	15.2	**14.0**
N23 C	10.8	12.1	13.5	12.4	13.1	**12.4**	11.6	10.9	12.4	13.1	14.2	**12.4**
N23 T	11.0	11.7	13.2	12.2	13.6	**12.4**	11.6	10.8	12.4	12.8	14.7	**12.5**
N25 C	10.2	11.4	12.7	12.4	13.8	**12.1**	10.9	12.1	13.3	13.7	13.7	**12.7**
N25 T	10.5	12.6*	12.6	12.4	13.9	**12.4**	11.4	12.5	14.3	13.9	14.9*	**13.4**
N26 C	14.1	13.7	15.3	13.5	14.8	**14.3**	13.7	12.5	14.1	15.2	14.3	**14.0**
N26 T	13.1	13.1	15.6	13.2	15.7	**14.1**	13.7	12.9	13.9	14.6	14.9	**14.0**
N28 C	10.3	12.9	14.1	12.8	13.4	**12.7**	11.3	11.5	13.0	12.4	13.8	**12.4**
N28 T	10.4	12.6	14.2	12.7	14.0	**12.8**	12.1	11.6	13.1	13.7	13.9	**12.9**
N30 C	14.6	14.1	16.3	15.6	16.0	**15.3**	15.2	14.4	14.9	15.2	15.9	**15.1**
N30 T	14.6	14.3	16.8	15.6	16.5	**15.6**	15.3	14.3	15.3	15.7	15.6	**15.3**
N32 C	10.9	12.7	14.5	12.9	14.1	**13.0**	12.8	13.0	14.0	14.7	14.5	**13.8**
N32 T	11.0	13.1	14.4	13.3	14.4	**13.2**	12.5	12.5	14.9	14.5	15.0	**13.9**
C mean	**11.6**	**12.8**	**14.3**	**13.2**	**14.2**	**13.2**	**12.5**	**12.2**	**13.6**	**13.8**	**14.3**	**13.3**
T mean	**11.6**	**12.8**	**14.3**	**13.3**	**14.5**	**13.3**	**12.7**	**12.3**	**14.0**	**14.0**	**14.8**	**13.6**
SED	0.7	0.5	0.6	0.5	0.6		0.4	0.2	0.5	0.6	0.4	
LSD05	1.3	1.0	1.1	1.1	1.1		0.8	0.5	1.1	1.3	0.9	

[a]The higher ERC percentages per crop and per treatment that are not significantly different from one another are underlined (P<0.05).
*%ERC of cane treated with nematicide significantly greater than the untreated control (P<0.05).

Table 5. Yield in tons ERC in the plant crop (plant) and from the first (1R) to the fourth ratoon (4R), per variety, with and without treatment with a nematicide, for the early season and late season trials. (C = control; T = treated with nematicide).

	Early season						Late season					
	ERC tons/ha						ERC tons/ha					
Variety	Plant	1R	2R	3R	4R	**Mean**	Plant	1R	2R	3R	4R	**Mean**
N14 C	15.4[a]	11.7	15.1	10.6	12.4	**13.1**	16.6	10.1	10.5	7.0	6.6	**10.2**
N14 T	16.9	13.8	14.5	10.4	9.6	**13.1**	17.9	11.6	12.0	11.9*	8.2	**12.3**
N19 C	16.4	9.8	10.6	9.5	9.4	**11.2**	13.7	9.4	9.6	6.1	5.9	**8.9**
N19 T	21.8*	9.8	13.9	8.9	10.0	**12.9**	17.0*	13.3*	16.9*	12.1*	8.4	**13.6**
N23 C	11.9	11.8	14.1	9.8	9.2	**11.4**	11.1	8.1	10.4	8.3	7.2	**9.0**
N23 T	15.9*	12.3	15.7	9.8	11.4	**13.0**	14.3*	9.9	11.6	11.6*	8.2	**11.1**
N25 C	15.6	14.7	15.6	12.1	12.6	**14.1**	14.1	14.1	14.5	9.7	8.5	**12.2**
N25 T	17.2	18.4	18.2	12.5	12.7	**15.8**	15.6	18.0*	19.7*	14.2*	9.8	**15.5**
N26 C	12.0	6.2	8.5	6.9	6.2	**8.0**	13.0	7.4	7.3	5.4	4.0	**7.4**
N26 T	15.1*	8.1	11.1	7.2	8.7	**10.0**	13.4	8.9	12.0*	10.9*	5.6	**10.2**
N28 C	15.6	11.4	14.8	8.1	8.7	**11.7**	12.4	9.6	10.9	8.0	6.9	**9.5**
N28 T	17.5	13.0	17.5	9.5	10.4	**13.6**	14.8	10.5	13.3*	12.1*	6.9	**11.5**
N30 C	15.9	6.6	7.3	6.7	7.5	**8.8**	15.5	9.0	7.5	6.0	5.4	**8.7**
N30 T	19.9*	8.6	11.3*	6.5	7.1	**10.7**	18.3	10.5	13.0*	11.5*	7.9	**12.3**
N32 C	17.2	14.8	15.8	11.0	9.6	**13.7**	15.5	13.1	10.2	8.1	5.6	**10.5**
N32 T	20.7*	17.3	17.9	12.2	9.8	**15.6**	16.4	17.3*	17.0*	13.1*	9.1*	**14.6**
SED	1.1	1.9	1.9	1.6	1.7		1.4	0.9	1.1	0.9	1.3	
LSD05	2.3	3.9	3.9	3.3	3.4		2.9	1.8	2.3	1.8	2.6	

[a]The higher yields per crop and per treatment that are not significantly different from one another are underlined (P<0.05).

*ERC yield significantly greater than the untreated control (P<0.05).

Table 6. Moisture and fibre content of the varieties, treated with and without a nematicide, for the early season and late season trials (averaged over the five crops).

	Early season	Late season		Early season	Late season
Control	Moisture %			Fibre % cane	
N14	71.8	69.4		13.1	15.5
N19	70.3	68.6		13.4	14.8
N23	70.7	69.6		13.7	14.6
N25	72.6	69.9		12.2	14.3
N26	69.3	68.0		13.8	15.0
N28	71.3	70.5		13.3	13.8
N30	69.3	68.6		12.9	13.5
N32	71.1	69.5		13.1	13.8
Mean	**70.8**	**69.3**		**13.2**	**14.4**
Nematicide					
N14	72.3	69.5		12.8	14.8
N19	70.4	68.8		13.0	14.4
N23	71.2	69.8		13.3	14.2
N25	72.7	69.8		12.0	13.8
N26	69.1	68.5		14.2	14.6
N28	71.6	70.4		12.9	13.6
N30	69.4	68.7		12.4	13.2
N32	71.6	69.7		12.3	13.7
Mean	**71.0**	**69.4**		**12.9**	**14.0**

Discussion

In both the early and late season trial, whether treated with nematicide or not, N25 was the top performing variety against which the others were measured. Good yields achieved with N25 have also been reported on poor soils and well-drained, heavy soils in Swaziland by Butler (2001) and Rostron *et al.* (1999), on heavy soils in Malawi, by Isyagi and Whitbread (2002), and in South Africa, by Redshaw and Nuss (2001). Summarising data from numerous trials in South Africa and Swaziland, Redshaw and Nuss (2001) found that among 12 varieties, N25 was the only one with good ERC yields in both early and late season harvesting cycles. They also found that the ERC content of most of the varieties, which included the eight in the present study, was significantly lower in the early season compared with late season (compare 11.7 and 13.2 %ERC respectively). In the present study, however, there was little difference.

Variety N14 responded the least to treatment with the nematicide, which indicates tolerance of the damage caused by the nematodes, or even resistance. The relatively small response to nematicide treatment of N25 in the early season trial and N28 in the late season trial, suggests that they too have a degree of tolerance to nematodes. N19, N26 and N30 were the varieties most susceptible to nematodes, judging by the large response to the nematicide in both trials.

The response in the yield of cane, following the application of nematicide in the late season trial, demonstrates the importance of nematodes on these soils. The average response of 21 tons cane would more than recover the cost of treatment (equivalent to about 10 tons cane). In contrast, the response to nematicide treatment in the early season was much smaller, indicating less damage caused by nematodes. The explanation for this seasonal difference in susceptibility to nematodes is probably as follows.

The time of year that sugarcane is planted or ratooned not only determines the nature of the physical environment in which the cane will grow but also the nature of its biological environment. Thus, the early development of cane planted or ratooned during the early part of the season in Mpumalanga will be during a period of decreasing rainfall, decreasing evapotranspiration and lower air and soil temperatures ([2]unpublished data). The lower temperatures not only slow down the activity of the cane plant but also that of its parasitic nematodes (Webster, 1987). *M. javanica* is the most important nematode parasite of sugarcane in South Africa and was abundant in both trials ([3]unpublished data). Optimum temperatures for its reproduction, egg hatch, movement, growth and development, range between 24 and 30ºC (Anon, 2005), http://plpnemweb.ucdavis.edu/nemaplex/Taxadata/G076S4.HTM). Soil temperatures at a depth of between 10 and 20 cm in Mpumalanga during the four months, May through August, average 21.9, 18.7, 18.8 and 20.7ºC ([2]unpublished data). In contrast, soil temperatures at the same depth for the four months, November through February, average 26.8, 27.9, 29.3 and 28.9ºC. It is logical to suppose that the activity of *M. javanica* will be inhibited during the early part of the season, from May onwards, and stimulated during the latter part of the season, from November onwards, and would explain the advantage of the early season cycle. A similar benefit from cropping on an autumn cycle occurs in Taiwan (Cadet and Spaull, 2005). Manipulating planting dates to avoid periods of peak nematode activity is used in a variety of crops in several countries (Bridge, 1987; Brown, 1987). Data presented here show that this practice could be adopted in sugarcane in the northern irrigated region, although additional yield benefit is derived from using a nematicide. Also, the correct choice of variety is necessary as some are highly susceptible, even during the early season. Planting and ratooning early in the season to minimise crop loss from nematodes is worth investigating in the rainfed areas of the South African sugar industry.

Acknowledgements

The authors acknowledge with thanks Mr Ferdie Potgieter and his son, Martin, for their willing assistance throughout the course of the two trials.

REFERENCES

Bridge J (1987). Control strategies in subsistence agriculture. pp 389-420 In: Brown RH and Kerry BR (Eds), *Principles and Practice of Nematode Control in Crops*. Academic Press, Sydney, Australia.

Brown RH (1987). Control strategies in low-value crops. pp 351-387 In: Brown RH and Kerry BR (Eds), *Principles and Practice of Nematode Control in Crops*. Academic Press, Sydney, Australia.

Butler DWF (2001). The performance of sugarcane varieties N23 and N25 on low yield potential soils in Swaziland. *Proc S Afr Sug Technol Ass* 75: 165-170.

Cadet P and Spaull VW (2005). Nematodes parasites of sugarcane. In: Luc M, Sikora RA and Bridge J (Eds), *Plant Parasitic Nematodes in Subtropical and Tropical Agriculture*. CAB International, Wallingford, UK (in press).

Isyagi MM and Whitbread MW (2002). Yield performance of South African sugarcane varieties in plant cane trials at Nchalo Sugar Estate, Malawi. *Proc S Afr Sug Technol Ass* 76: 207-211.

Redshaw KA and Nuss KJ (2001). Yield and quality differences between irrigated sugarcane varieties. *Proc S Afr Sug Technol Ass* 75: 160-164.

[2] Unpublished data from the meteorological site at Kaalrug, Mpumalanga, South Africa.
[3] VW Spaull (2005), South African Sugarcane Research Institute, Mount Edgecombe, South Africa.

Rostron H, Butler DWF and Zwane MD (1999). The performance of recently released South African varieties in Swaziland. *Proc S Afr Sug Technol Ass* 73: 147-156.

Spaull VW and Cadet P (2003). Impact of nematodes on sugarcane and the benefit of tolerant varieties. *Proc S Afr Sug Technol Ass* 77: 230-238.

Webster JM (1987). Introduction. pp 1-11 In: Brown RH and Kerry BR (eds), *Principles and Practice of Nematode Control in Crops*. Academic Press, Sydney, Australia.