

AN EVALUATION OF THE PERFORMANCE OF VARIETY N21 IN FIELD TRIALS

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Abstract

In 1989, variety N21 was released in the rainfed areas of the South African sugar industry as a variety highly resistant to eldana borer. Its subsequent inclusion in the agronomy variety trials programme has to date produced 32 harvested crops from 18 field trials, the results of which are given in this paper. Comparisons of yield and cane quality, reaction to eldana borer and selected agronomic characteristics are made, relative to NCo376. The yield performance of variety N21 relative to other commercial varieties in seasons of favourable and droughted conditions is discussed. Under favourable rainfall conditions N21 did not perform as well as varieties N12, N16, N19 and NCo376. However, when conditions of stress were experienced both in the presence and absence of eldana, the performance of N21 was superior to that of other varieties.

Introduction

In October 1989, N21 was released in the rainfed areas of the sugar industry as a variety highly resistant to eldana borer. This characteristic suggested that the variety would be suitable for use in areas of high eldana risk, particularly where cane might need to be carried over.

New sugarcane varieties are recommended for release by the Experiment Station on their sucrose yielding ability, resistance to pests and diseases and other agronomic characteristics. Released varieties and varieties in the pre-release stage are routinely included in the Agronomy department variety programme for further evaluation. The main objectives of the agronomy programme are to compare new varieties with currently grown varieties in as many different environmental situations as possible, to determine varietal responses to farm and managerial practices, to provide a continuous assessment of released varieties and to collect information to help in choosing the most profitable sugarcane variety (Inman-Bamber and Stead, 1990). The agronomy variety programme, initiated in 1966, currently consists of over 40 field trials distributed throughout the industry. Results which include N21 have been obtained from 32 harvested crops and 66 sampling occasions from 18 trials conducted in the past three seasons. The results are discussed in this paper.

Experiment procedures

Field trials were randomised, each trial including four to nine varieties replicated five to eight times. Row spacing ranged from 1,0 m to 1,4 m and plot sizes from five to six rows of 8-10 m long. One row on each side of each plot and 0,5-1,0 m at the end of each nett row were discarded for growth measurements and measurements of yield at harvest. Cane in each plot was weighed at harvest and a sample of 12-16 stalks taken from each plot for sucrose analysis.

At harvest an assessment was made of the level of eldana damage to the crop. A sample of 25-50 stalks was randomly chosen from each plot and records made of the numbers of joints, damaged joints and eldana per stalk.

Yielding ability is determined in field trials in which the new variety is grown under identical conditions to standard varieties. For many years NCo376 constituted more than 70% of sugarcane crushed, and was grown throughout the industry. Whereas NCo376 has been the standard variety since these trials started, varieties N12 and N14 are now included as additional standards in the south and north of the industry respectively.

Results and discussion

Sucrose content

Figure 1 shows the sucrose content of N21 expressed as a percentage of that of NCo376. The seasonal pattern is distinct, with evidence of a sucrose content slightly better early in the season (April) increasing to a mid/late season (September) advantage of about 6%. The mean sucrose content of N21 from all trials was 5% (0,75 units) higher than NCo376. In the absence of eldana, the sucrose content of N21 was 3% (0,4 units) higher. Results from four trials where levels of eldana in NCo376 ranged from 18 to 38 eldana per 100 stalks (e/100) (mean 26 e/100), showed the mean sucrose content of N21 was 20% (1,8 units) higher.

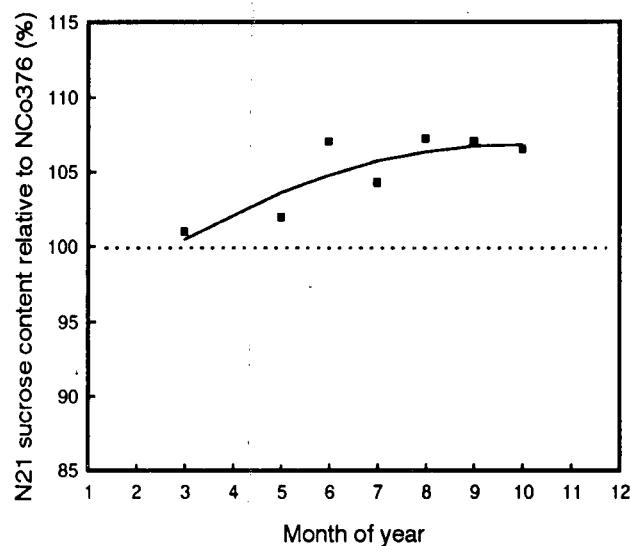


FIGURE 1 Seasonal variation in sucrose content of N21 expressed as a percentage of NCo376.

Reaction to eldana

Figure 2 indicates the percentage joints bored in N21 relative to NCo376. It is noteworthy that damage in N21, at all levels of infestation, was about half that in NCo376. It is obvious from Figure 3 that, as the percentage of joints bored increases, so the relative advantage in sucrose yield of N21 also increases.

Sucrose yield

The sucrose yield of N21 expressed as a percentage of that of NCo376 is presented in Figure 4. The linear regression

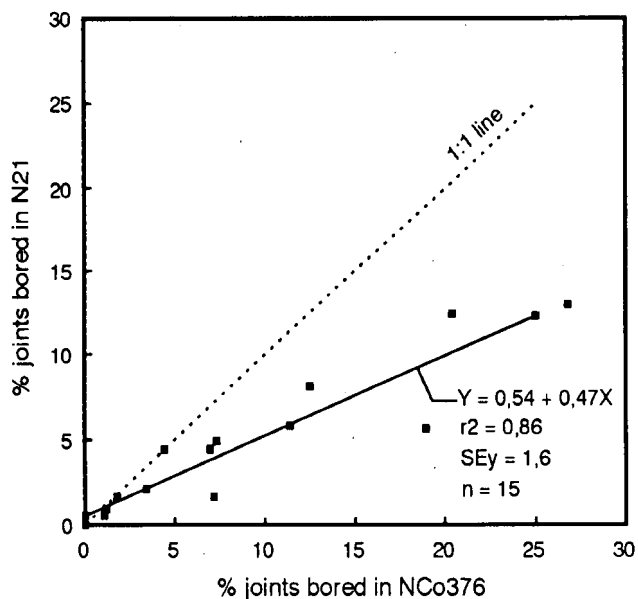


FIGURE 2 Relationship between level of eldana damage in N21 and NCo376 grown under identical conditions.

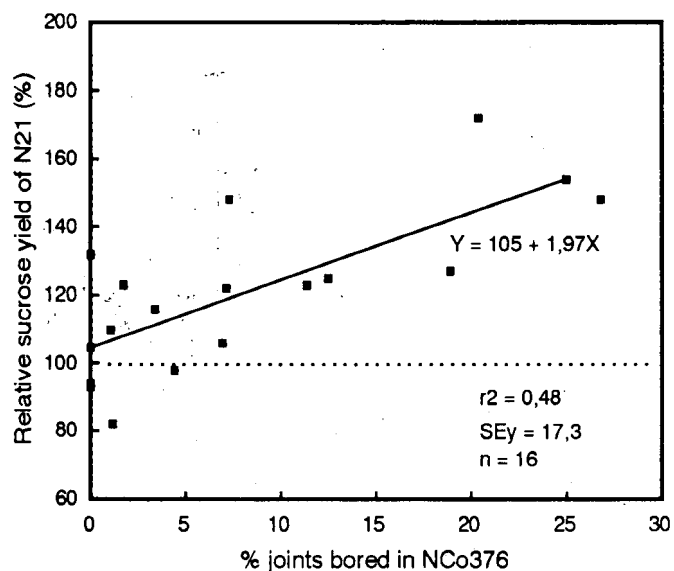


FIGURE 3 Relationship between the relative sucrose yield of N21 and level of eldana damage in NCo376.

curve shows the expected sucrose yield of N21 as changes occur in environmental yield potential (as evidenced by the performance of NCo376), and highlights the yield advantage of N21 in less favourable conditions and its disadvantage in situations of high potential.

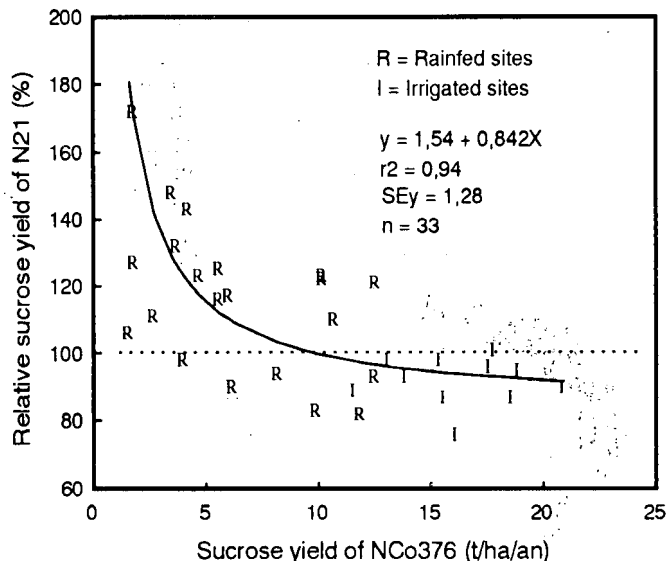


FIGURE 4 Sucrose yield of N21 compared with that of NCo376 grown under identical conditions.

Month and age of harvest were tested as independent variables but their contributions were not significant. Eldana was not considered as a variable as eldana assessments were not made at all sites.

As shown in Table 1, weather conditions over the past four seasons have been characterised by two seasons of favourable rainfall followed by two seasons of extremely stressful drought conditions, which have had a corresponding effect on crop yield and the performance of varieties. In Appendix 1, the sucrose yields of N21, NCo376 and the top yielding variety in each trial and season of harvest are compared. The appendix excludes data from irrigated areas.

Results from three trials conducted in the irrigated northern areas (two at Pongola and one at Malelane) and harvested on 11 occasions indicated that the average sucrose yield of N21 was 8% (1,2 ts/ha/an) less than that of the average sucrose yield (16,3 ts/ha/an) of NCo376 and 17% (3,2 ts/ha/an) less than the average sucrose yield (18,4 ts/ha/an) of top yielding varieties (N14, N17, N19).

Crop characteristics

The low stalk population of N21 (96 000/ha, 18% less than NCo376), and generally slow canopy development are a disadvantage with regard to weed control. Elongation of the primary stalk is very rapid and tillering appears to continue for a long period. Stalk length at harvest was on average 22% (38 cm) longer than NCo376 and severe lodging was recorded in trials where cane yield exceeded 110 tc/ha. Recordings made at a site on the North Coast, noted for the

Table 1
Rainfall distribution by region (June 1989 to May 1993)

Region	Rainfall (mm)											
	June 1989 to May 1990			June 1990 to May 1991			June 1991 to May 1992			June 1992 to May 1993		
	Rain	LTM	% LTM	Rain	LTM	% LTM	Rain	LTM	% LTM	Rain	LTM	% LTM
S Coast	1221	1017	120	839	1013	83	661	1005	66	550	994	55
N Coast	1168	1035	113	1085	1037	105	699	1029	68	624	1019	61
Zululand	1100	1014	108	1173	1017	115	583	1007	58	628	998	63
Midlands	946	975	97	968	978	99	753	971	78	556	949	59
Mean			110			101			68			59

high incidence of flowering in NCo376, indicated that 8% of stalks of N21 flowered compared with 38% and 40% in N12 and NCo376 respectively. N21 has germinated and ratooned well on a wide range of soil types, but variable and somewhat unpredictable stalk populations have been recorded on shallow, black, blocky clays of the Milkwood and Bonheim soil forms. Some excellent crops of N21 have been observed on deep, red coastal sands and moderately deep granite soils. Fibre % cane was 17% (2,2 units) higher than that of NCo376.

Conclusion

The results of this series of trials confirm the resistance of N21 to eldana and have shown its usefulness in less favourable conditions, which included sites in the hinterland and Midland regions where eldana was of no significance.

In seasons of average or above average rainfall, N21 cannot be expected to match the performance of varieties such as N12, N16, N19 and NCo376, and should probably be planted only on a limited proportion of the farm. The results also confirm the relatively poor performance of N21 in irrigated areas.

Acknowledgements

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REFERENCES

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Appendix 1

Comparison of the sucrose yields of N21 with those of NCo376 and performance relative to other varieties over the past three seasons

Site	Month and year of harvest	Ratoon	Crop age (months)	Sucrose yield (ts/ha/an)					Comparison of performance of varieties (ts/ha) expressed as % of N21					
				NCo376	N21	N21 Diff (+/-)	N21 As % of NCo376	LSD (0,05)	N21	NCo376	N12	N16	N17	N19
Paddock	July 1991	P	20,3	11,9	9,8	-2,1	82	1,5	100	121	107	113	-	-
Dumisa	June 1991	P	18,7	10,7	10,8	+0,1	101	1,3	100	99	95	110	102	-
Dalton	July 1991	P	20,5	8,2	7,7	-0,5	94	1,6	100	106	119	-	-	-
Hillhead	August 1991	P	14,0	9,9	8,2	-1,7	83	1,6	100	121	118	-	-	-
Shakaskraal	July 1991	P	15,7	6,0	7,7	+1,1	117	1,5	100	85	83	100	99	-
Monzi	October 1991	P	11,9	12,5	11,6	-0,9	93	1,3	100	107	-	-	103	106
Ottawa	July 1991	R1	11,5	11,4	11,4	0	100	1,8	100	100	103	104	-	-
Ottawa	November 1991	R1	15,5	9,6	8,8	-0,8	92	1,6	100	108	113	124	-	-
Mean				10,0	9,5	-0,5	95							
Dumisa	August 1992	R1	14,4	5,6	6,5	+0,9	116	1,0	100	86	85	105	75	-
Illovo	October 1992	P	13,3	2,7	3,0	+0,3	111	0,8	100	90	91	97	90	-
Hillhead	September 1992	R1	10,1	6,2	5,4	-0,8	90	2,5	100	108	98	-	-	-
Shakaskraal	August 1992	R1	13,2	4,2	6,0	+1,8	125	1,3	100	72	68	94	83	-
Monzi	October 1992	R1	13,4	10,2	12,5	+2,3	123	1,8	100	82	-	-	102	95
Mean				5,8	6,7	+0,9	113							
Sezela	June 1993	P	17,0	1,8	3,1	+1,3	172	0,6	100	58	61	55	58	-
Paddock	September 1993	R1	11,1	4,7	5,8	+1,1	123	1,1	100	81	74	-	-	-
Umzimkulu	May 1993	P	15,2	5,6	7,0	+1,4	125	1,8	100	80	83	76	49	-
Umzimkulu	October 1993	P	19,8	3,5	5,2	+1,7	148	1,1	100	67	81	60	54	-
Dalton	July 1993	R1	23,6	3,7	4,9	+1,2	132	0,7	100	76	86	-	-	-
Eston	September 1993	P	19,0	8,0	9,7	+1,7	121	1,2	100	82	100	89	-	-
Shakaskraal	July 1993	R2	11,1	3,5	5,2	+1,7	148	1,6	100	67	90	92	104	-
Empangeni	October 1993	P	11,9	4,0	3,8	-0,2	98	1,0	100	105	87	87	82	103
Monzi	September 1993	R2	11,5	10,2	12,4	+2,2	122	1,7	100	82	-	-	94	102
Mean				5,0	6,3	+1,3	132							