

SOUTH AFRICAN SUGAR INDUSTRY AGRONOMISTS' ASSOCIATION

3300/40 VARIETY SUSCEPTIBILITY TO SMUT

Catalogue: 1175
Object: To observe the development of smut infection in 31 varieties of sugarcane under conditions of natural infection.

This Crop: Plant Age: 12,0 months (12.9.78 to 12.9.79)

Location: RSA Experiment Station, Impala Block E7-8

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

Design: Randomised blocks, 3 replications

Spacing: 1,5 m between rows

Fertiliser: (kg/ha) N P₂O₅ K₂O
 — — —
 180 100 60

Rainfall: 716 mm Irrigation: 1283 mm

Methods: Plots consisted of a single row 15 m in length, with stools spaced 0,5 m apart. The border rows, and every third internal row, were planted to NCo 376 to serve as infection rows. Seedcane for these rows was dipped in a fresh smut spore suspension immediately prior to planting. Seedcane for the varietal entries was not dipped in the spore suspension nor treated with mercurial fungicide before planting.

Monthly records were taken of smut whips (which were not rogued), and infected stools per plot. Whip counts per hectare were based on maximum recorded values. Millable canes were counted and weighed at harvest, and sampled for quality analysis.

Treatments: A total of 30 varieties were tested against NCo 376. These included 25 new Hawaiian introductions, and 5 other varieties for which smut ratings were required.

Smut rating Key: The following system was used for rating of smut infection levels:

Rating	Description	Whips/ha
0	Immune	0
1	Very highly resistant	1-60
2	Highly resistant	61-120
3	Resistant	121-240
4	Intermediate - resistant	241-625
5	Intermediate - average	626-1875
6	Intermediate - susceptible	1876-5000
7	Susceptible	5001-15000
8	Highly susceptible	15001-30000
9	Very highly susceptible	>30000

It should be noted that the small plots ($67,5 \text{ m}^2$ per variety) precluded accurate resistance ratings. The minimum possible count of 1 whip per variety gave it a value of 148 whips/ha or a rating of 3, which would have been more accurately denoted as "1 to 3".

RESULTS

Relevant data for the plant crop are summarised in the attached tables.

- (a) Cane and sugar yields. Plots were too small for valid yield comparisons, and records merely served to provide an indication of yield potential. Yields were generally low throughout the trial, in many cases due to poor establishment.
- (b) ERC% cane. A satisfactory range of values was recorded, with exceptional quality evident in H 51-8194, H 57-4114, H 58-7348, H 59-9018, and Q 57.
- (c) Flowering. A few flowers were recorded at harvest in NCo 293 and CP 29-116 (3% and 2% respectively), but not in any of the other entries
- (d) Leaf scald. Detailed records of leaf scald disease showed a high degree of susceptibility in only two varieties, viz. H 49-104 and H 57-219, but results from the Open Quarantine Nursery (2010/1) showed that most of the Hawaiian varieties were susceptible to a greater or lesser extent, with only 3 remaining free of the disease.
- (e) Smut rating. The only varieties to remain free of smut were H 63-1418, Mex 54-88, and CP 29-116.

The level of smut infection was relatively low, as indicated by the rating of 5 for NCo 376 (normally 7 or 8 rating), and it can be expected to rise considerably in the first ratoon crop.

Smut ratings of the Hawaiian entries can be considered in conjunction with those obtained in the open quarantine nursery, and data from both trials are thus presented in the final table. They show that 18 of the 24 entries had ratings of 7 or more after the first ratoon crop. Two of the remaining 6 varieties were more severely infected in the plant crop of 3300/40 than in the first ratoon in the nursery. H 63-1418 appeared to be immune to smut and resistant to leaf scald, and it exhibited good yield potential relative to NCo 376. Other varieties showing promise were H 65-606, H 61-3556, and H 51-8029, all of which yielded well and exhibited good disease resistance.

KEC/October, 1979.

3300/40 VARIETY SUSCEPTIBILITY TO SMUT

PLANT CROP HARVEST DATA

Variety	CANE YIELD		ERC		TERC	
	t/ha	% of NCo 376	% cane	% of mean	per ha	% of NCo 376
H 48-4605	121,30	110,6	11,74	91,6	14,18	98,6
H 49-104	58,22	53,1	13,08	102,0	7,68	53,4
H 51-8029	143,08	130,5	12,66	98,8	18,12	126,0
H 51-8194	149,42	136,3	14,43	112,6	21,60	150,2
H 56-278	116,50	106,2	12,87	100,4	14,99	104,2
H 57-219	102,85	93,8	13,64	106,4	13,99	97,3
H 57-4114	97,51	88,9	14,10	110,0	13,66	95,0
H 58-7348	131,62	120,0	14,19	110,7	18,68	129,9
H 59-2122	87,44	79,7	11,04	86,1	9,74	67,7
H 59-9018	110,40	100,7	14,56	113,6	16,09	111,9
H 60-2437	109,54	99,9	12,31	96,0	13,46	93,6
H 60-3862	90,90	82,9	12,40	96,7	11,25	78,2
H 60-6909	117,36	107,0	12,25	95,6	14,40	100,1
H 61-3054	115,47	105,3	13,40	104,5	15,63	108,7
H 61-3566	137,30	125,2	10,47	81,7	14,42	100,3
H 61-4731	104,59	95,4	13,41	104,6	14,08	97,9
H 63-1418	134,22	122,4	12,59	98,2	16,82	117,0
H 63-6983	58,61	53,4	11,25	87,8	6,58	45,8
H 64-225	125,07	114,1	11,34	88,5	14,23	99,0
H 64-8890	128,47	117,2	12,89	100,5	16,48	114,6
H 65-606	118,99	108,5	13,01	101,5	15,45	107,4
H 65-1600	115,50	105,3	12,59	98,2	14,51	100,9
H 66-1447	77,39	70,6	12,57	98,0	9,71	67,5
H 66-2097	111,23	101,4	10,18	79,4	11,32	78,7
Mex 54-88	79,26	72,3	13,72	107,0	10,87	75,6
NCo 293	116,50	106,2	13,71	106,9	15,87	110,4
NCo 334	102,40	93,4	13,53	105,5	13,86	96,4
Q 57	50,05	45,6	14,06	109,7	7,03	48,9
CP 29-116	121,25	110,6	13,16	102,7	15,90	110,6
H 56-502	85,39	77,9	13,16	102,7	11,23	78,1
NCo 376	109,66	100,0	13,11	102,3	14,38	100,0
L.S.D.						
P=0,05	27,79	-	1,06	-	3,77	-
P=0,01	36,98	-	1,41	-	5,02	-
Trial mean	107,34	97,9	12,82	100,0	13,75	95,6
S.E. plot \pm	17,02	-	0,65	-	2,31	-
S.E. mean \pm	9,83	-	0,37	-	1,33	-
C.V.%	15,86	-	5,05	-	16,81	-

3300/40 VARIETY SUSCEPTIBILITY TO SMUT

PLANT CROP DATA

Variety	Stalks per ha x 10 ⁻³	% lodging	Leaf scald		Smut		Rating
			Infected stalks/ha	% stool infection	Whips per ha	% stool infection	
H 48-4605	66,2	63	2 074	3,3	5 037	22,2	7
H 49-104	41,2	10	31 852	69,1	889	5,9	5
H 51-8029	67,4	37	1 778	5,7	296	1,1	4
H 51-8194	79,7	37	0	0,0	1 630	9,8	5
H 56-278	64,6	48	5 037	13,3	13 630	46,7	7
H 57-219	63,7	82	13 482	23,8	5 481	19,0	7
H 57-4114	52,0	27	1 482	4,9	9 185	37,0	7
H 58-7348	68,5	85	2 667	8,7	1 037	3,2	5
H 59-2122	54,4	52	0	0,0	4 148	12,4	6
H 59-9018	60,9	52	889	4,4	9 778	41,1	7
H 60-2437	62,2	53	4 148	8,2	296	2,4	4
H 60-3862	56,7	93	0	0,0	2 222	13,5	6
H 60-6909	61,8	63	0	0,0	46 222	91,4	9
H 61-3054	48,9	52	1 778	5,6	444	2,3	4
H 61-3556	59,7	97	0	0,0	10 519	41,8	7
H 61-4731	43,2	35	3 111	10,3	2 963	17,1	6
H 63-1418	63,6	30	0	0,0	0	0,0	0
H 63-6983	44,1	42	2 667	15,8	15 852	55,7	8
H 64-225	69,5	88	444	2,5	6 370	35,9	7
H 64-8890	63,3	47	148	5,9	11 852	50,6	7
H 65-606	66,3	28	4 889	14,7	296	1,3	4
H 65-1600	57,0	55	2 519	5,3	4 148	24,0	6
H 66-1447	50,7	55	0	0,0	1 185	6,7	5
H 66-2097	52,1	93	0	0,0	8 444	42,9	7
Mex 54-88	52,9	38	444	2,2	0	0,0	0
NCo 293	78,1	45	0	0,0	148	1,1	3
NCo 334	85,2	27	0	0,0	296	1,1	4
Q 57	39,7	3	0	0,0	2 815	9,5	6
CP 29-116	77,6	82	0	0,0	0	0,0	0
H 56-502	58,7	25	1 037	4,6	2 074	9,2	6
NCo 376	101,3	17	0	0,0	889	2,3	5
Means	61,7	50	2 595	6,7	5 424	19,6	-

CONSOLIDATED DISEASE RECORDS

Project 2010/1 Open Quarantine Nursery - Plant & 1st ratoon

Project 3300/40 Variety Susceptibility to Smit - Plant crop only

VARIETY	SMUT						LEAF SCALD	
	Whips/ha			Rating			Stalks/ha	
	2010/1		3300/40	2010/1		3300/40	2010/1	3300/40
	P	1R	P	P	1R	P	1R	P
H 48-4605	0	48 333	5 037	0	9	7	5 556	2 074
H 49-104	0	7 222	889	0	7	5	21 111	31 852
H 51-8029	0	3 333	296	0	6	4	1 667	1 778
H 51-8194	0	45 556	1 630	0	9	5	6 667	0
R 56-278	1 667	66 667	13 630	5	9	7	20 000	5 037
H 57-219	0	3 333	5 481	0	6	7	8 333	13 482
H 57-4114	3 889	151 111	9 185	6	9	7	15 000	1 482
H 58-7348	0	16 667	1 037	0	8	5	2 222	2 667
H 59-2122	1 667	48 889	4 148	5	9	6	8 889	0
R 59-9018	556	39 444	9 778	4	9	7	12 778	889
H 60-2437	0	7 222	296	0	7	4	8 889	4 148
H 60-3862	1 111	2 778	2 222	5	6	6	2 222	0
H 60-6909	60 556	159 444	46 222	9	9	9	0	0
H 61-3054	0	16 111	444	0	8	4	8 889	1 778
H 61-3556	1 667	1 111	10 519	5	5	7	0	0
H 61-4731	8 333	25 556	2 963	7	8	6	20 000	3 111
H 63-1418	0	0	0	0	0	0	1 111	0
H 63-6983	6 111	19 444	15 852	7	8	8	4 444	2 667
H 64-225	3 889	157 778	6 370	6	9	7	28 889	444
H 64-8890	0	5 556	11 852	0	7	7	10 556	148
H 65-606	0	0	296	0	0	4	0	4 889
H 65-1600	1 111	176 667	4 148	5	9	6	6 667	2 519
H 66-1447	556	8 333	1 185	4	7	5	556	0
H 66-2097	2 222	82 222	8 444	6	9	7	4 444	0
Means	3 889	45 532	6 747	-	-	-	8 287	3 290

SOUTH AFRICAN SUGAR INDUSTRY AGRONOMISTS' ASSOCIATION

3300/40 VARIETY SUSCEPTIBILITY TO SMUT

TERMINAL REPORT

Catalogue: 1175
Object: To observe the development of smut infection in 31 varieties of sugarcane under conditions of natural infection.

Planted: 12th September, 1978.

Terminated: 20th May, 1980, after the first ratoon crop.

<u>Harvest dates and ages:</u>	<u>Harvest</u>	<u>Age</u>
P	12.9.79	12,0 months.
LR	20.5.80	8,3 months.

Location: ZSA Experiment Station, Impala Block E7-E8.

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

Design: Randomised blocks, 3 replications.

Spacing: 1,5m between rows.

<u>Fertiliser (kg/ha):</u>	<u>N</u>	<u>P₂O₅</u>	<u>K₂O</u>
P	180	100	60
LR	180	100	60

<u>Irrigation and Rainfall:</u>	<u>Irrigation (mm)</u>	<u>Rain (mm)</u>
P	1 283	716
LR	616	757

Treatments: A total of 30 varieties were tested against NCo 376. These included 25 Hawaiian introductions, and 5 other varieties for which smut ratings were required.

Conduct: Plots consisted of a single row 15m in length, with stools spaced 0,5m apart. The border rows, and every third internal row, were planted to NCo 376 to serve as infection rows. Seedcane for these rows was dipped in a fresh smut spore suspension immediately prior to planting. Seedcane for the varietal entries was not dipped in the spore suspension nor treated with fungicide before planting. Monthly records were taken of smut whips and infected stools per plot, and records were also taken of leaf scald incidence.

Smut rating Key: The following system was used for rating of smut infection levels:

2/. Rating ...

<u>Rating</u>	<u>Description</u>	<u>Whips/ha</u>
0	Immune	0
1	Very highly resistant	1-60
2	Highly resistant	61-120
3	Resistant	121-240
4	Intermediate - resistant	241-625
5	Intermediate - average	626-1 875
6	Intermediate - susceptible	1 876-5 000
7	Susceptible	5 001-15 000
8	Highly susceptible	15 001-30 000
9	Very Highly susceptible	>30 000

It should be noted that the small plots (67,5m² per variety) precluded accurate resistance ratings. The minimum possible count of 1 whip per variety is equivalent to 148 whips/ha with a rating of 3, which would be more accurately denoted as "1 to 3".

RESULTS

Relevant disease records from the plant and first ratoon crops are shown in the attached tables in conjunction with those recorded from the open quarantine nursery (Project 2010/1). The latter trial was grown under similar conditions with infection rows of NCo 376 throughout, but with only one small plot of each of the Hawaiian varieties and no replication.

Smut incidence. The level of smut incidence in the plant crop was relatively low, as indicated by the rating of 5 for NCo 376 (normally 7 or 8 rating), but infection increased considerably in the first ratoon. A similar pattern was evident in both trials, with the open quarantine nursery showing an even greater increase in smut incidence in the ratoon crop.

The Hawaiian varieties were characterised by a high degree of smut susceptibility, with 18 out of 25 giving ratings of 8 or 9, and only two with ratings lower than 7, viz. H 51-8029 (6 rating), and H 63-1418, which remained free of smut in both trials. The only other variety with apparent immunity was Mex 54-88.

Leaf Scald. Records of leaf scald disease provided a measure of response to conditions of natural infection, and served to identify those varieties with high susceptibility.

Results showed that most of the Hawaiian entries were susceptible to a greater or lesser extent, with only two remaining free of the disease (H 60-6909, and H 61-3556) and several others showing good resistance. Many of the varieties exhibited extreme susceptibility, resulting in extensive stool mortality and loss of stand after the first ratoon crop.

CONCLUSIONS

Due to the high levels of disease incidence in the majority of varieties, the trial was terminated after the first ratoon instead of after the 2nd ratoon as is normally the case in smut susceptibility trials.

The only varieties selected for critical yield evaluation in further trials were: H 51-8029
H 63-1418
Mex 54-88
NCo 334

CONSOLIDATED DISEASE RECORDS

Project 2010/1 : Open Quarantine Nursery - Plant and 1st ratoon.
 Project 3300/40 : Variety Susceptibility to Smut - Plant and 1st ratoon.

VARIETY	SMUT WHIPS PER HECTARE				SMUT RATING			
	3300/40		2010/1		3300/40		2010/1	
	P	LR	P	LR	P	LR	P	LR
H 48-4605	5 037	139 407	0	43 333	7	9	0	9
H 49-104	899	4 148	0	7 222	5	6	0	7
H 51-8029	296	1 185	0	3 333	4	5	0	6
H 51-8194	1 630	48 148	0	45 556	5	9	0	9
H 56-278	13 630	43 556	1 667	66 667	7	9	5	9
H 56-502	2 074	35 926	-	-	6	9	-	-
H 57-219	5 481	26 074	0	3 333	7	8	0	6
H 57-4114	9 185	63 852	3 889	151 111	7	9	5	9
H 58-7348	1 037	11 852	0	16 667	5	7	0	8
H 59-2122	4 148	42 667	1 667	48 889	6	9	5	9
H 59-9018	9 778	26 074	556	39 444	7	8	4	9
H 60-2437	296	4 889	0	7 222	4	6	0	7
H 60-3862	2 222	19 852	1 111	2 778	6	8	5	6
H 60-6909	46 222	91 111	60 556	159 444	9	9	9	9
H 61-3054	4 444	9 037	0	16 111	4	7	0	8
H 61-3556	10 519	12 000	1 667	1 111	7	7	5	5
H 61-4731	2 963	17 778	8 333	25 556	6	8	7	8
H 63-1418	0	0	0	0	0	0	0	0
H 63-6983	15 852	27 111	6 111	19 444	8	8	7	8
H 64-225	6 370	68 444	3 889	157 778	7	9	6	9
H 64-8890	11 852	13 481	0	5 556	7	7	0	7
H 65-606	296	10 815	0	0	4	7	0	0
H 65-1600	4 148	39 407	1 111	176 667	6	9	5	9
H 66-1447	1 185	33 333	556	8 333	5	9	4	7
H 66-2097	8 444	149 481	2 222	82 222	7	9	6	9
Mex 54-88	0	0	-	-	0	0	-	-
NCo 293	148	72 741	-	-	3	9	-	-
NCo 334	296	4 741	-	-	4	6	-	-
Q57	2 815	28 296	-	-	6	8	-	-
CP 29-116	0	1 926	-	-	0	6	-	-
NCo 376	889	31 556	-	-	5	9	-	-
Means	5 424	34 738	3 889	45 532	-	-	-	-

CONSOLIDATED DISEASE RECORDS (Cont.)

Project 2010/1 : Open Quarantine Nursery - Plant and 1st Ratoon

Project 3300/40 : Variety Susceptibility to Smut - Plant and 1st Ratoon

VARIETY	SMUT % STOOL INF.		LEAF SCALD INFECTED STALKS PER HA			LEAF SCALD % STOOL INFECTIONS		% STOOL MORTALITY MAINLY DUE TO LEAF SCALD		
	3300/40		3300/40		2010/1	3300/40			3300/40	
	P	LR	P	LR	LR	P	LR	P	LR	Total
H 48-4605	22,2	12,9	2 074	8 741	5 556	3,3	26,6	2,2	12,9	19,6
H 49-104	5,9	15,2	31 852	42 222	21 111	69,1	92,2	25,3	10,6	35,2
H 51-8029	1,1	2,3	1 778	1 630	1 667	5,7	3,6	6,5	3,5	9,7
H 51-8194	9,8	23,1	0	0	6 667	0,0	0,0	1,1	3,3	5,4
H 56-278	46,7	50,8	5 037	20 296	20 000	13,3	74,2	19,4	4,5	31,2
H 56-502	9,2	39,8	1 037	13 926	-	4,6	45,0	6,5	6,2	18,3
H 57-219	19,0	25,3	13 482	27 852	8 333	23,8	66,2	9,7	19,3	28,0
H 57-4114	37,0	48,0	1 482	9 333	15 000	4,9	26,1	12,9	10,5	26,9
H 58-7348	3,2	12,4	2 667	2 222	2 222	8,7	12,4	0,0	1,1	3,3
H 59-2122	12,4	50,6	0	13 333	8 889	0,0	37,8	3,3	3,5	10,9
H 59-9018	41,1	31,8	889	11 407	12 778	4,4	37,2	3,2	6,8	11,8
H 60-2437	3,4	11,8	4 148	17 630	8 889	8,2	57,8	7,6	14,5	29,4
H 60-3862	13,5	23,9	0	296	2 222	0,0	1,1	4,3	1,1	6,5
H 60-6909	91,4	55,0	0	0	0	0,0	0,0	0,0	1,1	2,2
H 61-3054	2,3	14,6	1 778	6 667	8 889	5,6	26,8	5,5	8,4	16,5
H 61-3556	41,8	15,1	0	0	0	0,0	0,0	2,2	2,3	7,5
H 61-4731	17,1	25,7	3 111	11 407	20 000	10,3	56,1	17,4	13,5	30,4
H 63-1418	0,0	0,0	0	296	1 111	0,0	3,5	0,0	0,0	0,0
H 63-6983	55,7	33,3	2 667	7 852	4 444	15,8	51,2	22,2	17,8	58,9
H 64-225	35,9	51,6	444	13 926	28 889	2,5	45,9	15,2	17,7	44,6
H 64-8890	50,6	17,7	148	13 926	10 556	5,9	44,2	6,6	5,0	16,5
H 65-606	1,3	24,0	4 889	7 704	0	14,7	29,7	13,8	2,7	16,1
H 65-1600	24,0	35,7	2 519	13 333	6 667	5,3	44,8	19,4	11,4	33,3
H 66-1447	6,7	21,1	0	148	556	0,0	1,1	3,2	2,2	5,4
H 66-2097	42,9	78,6	0	7 556	4 444	0,0	25,0	9,7	29,8	36,6
Mex 54-88	0,0	0,0	444	0	-	2,2	0,0	1,1	1,1	2,2
NCo 293	1,1	51,2	0	6 963	-	0,0	8,1	5,4	6,7	9,8
NCo 334	1,1	4,6	0	0	-	0,0	0,0	4,4	0,0	4,4
Q 57	9,5	23,0	0	1 333	-	0,0	7,1	14,0	5,4	18,6
CP 29-116	0,0	5,6	0	296	-	0,0	1,1	3,2	0,0	4,3
NCo 376	2,3	32,2	0	3 259	0	0,0	9,3	2,2	4,4	4,4
Means	19,6	28,9	2 595	8 502	8 287	6,7	26,9	8,0	7,3	17,7