SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

CODE: SMUT 2/85/Sw UBO
CAT. NO.: 1647

TERMINAL REPORT

TITLE: LEVELS OF SMUT ROGUING IN NCo376

1. PARTICULARS OF PROJECT

This crop	:	9th Ratoon
Site	:	Ubombo Ranches, Mbabalala B 6
Region	:	Northern Irrigated (Swaziland)
Design	:	6 x 6 Latin Square
Soil Set	:	'S'
Variety	:	NCo376
Fertilizer (kg/ha)	:	N P K 160 - 150
Dates	:	28/7/87 - 8/8/88
Age	:	12.3 months

2. OBJECTIVES

2.1 To determine the effects of different levels of roguing on the expression of smut in NCo376.

2.2 To assess the effects of roguing on yield.

3. TREATMENTS

Six levels of roguing were applied to the plots.

Treatment 1	:	No roguing
Treatment 2	:	One roguing at 6 weeks
Treatment 3	:	Two roguings at 6 and 12 weeks
Treatment 4	:	Four roguings at 6, 9, 12, and 15 weeks
Treatment 5	:	Four roguings at 6, 12, 18, and 24 weeks

Treatment 6 : Eight roguings at 6, 9, 12, 15, 18, 21, 24 and 27 weeks

Notes on treatments

* The gross plot area was a 54 metre square area comprising 9 sprinkler plots each 18 metres square.

* The nett plot for measurement of smut incidence was the center 18 metre square plot.

* Measurement of smut incidence was carried out 2 days before the roguing treatments. No post-roguing measurement was carried out as the trial theme was to assess the effectiveness of commercial roguing practice.

* Measurement of smut incidence was assessed as whips (exposed and incipient) infected and stools infected.

* Total shoot counts were carried out at 6 week intervals.

* The first roguing was carried out at about knee height (six weeks) and was done by 'chipping out' infected plant material. Subsequent roguings were done by 'pulling' infected material away from the stool.

4. RESULTS (ROGUING)

4.1 Table 1. Levels of infected stools (%) between 6 and 27 weeks.

TREATMENT	SEPT 29 6 wks	OCT 20 9 wks	NOV 10 12 wks	DEC 1 15 wks	DEC 21 18 wks	JAN 12 21 wks	FEB 2 24 wks	FEB 23 27 wks
1	9.2	20.6	27.7	32.0	31.4	27.6	25.4	21.5
2	5.0	8.9	16.1	18.7	22.0	22.0	19.6	15.7
3	5.3	11.7	16.1	8.8	14.3	13.9	13.0	12.4
4	5.0	8.5	10.9	10.9	10.5	10.9	11.1	9.8
5	4.8	7.8	15.3	6.6	9.5	6.3	5.6	5.4
6	6.2	8.6	8.9	8.7	7.3	6.7	5.2	4.4
LSD(P=0.05)*	3.4	4.9	8.4	7.8	8.9	7.2	6.2	7.0
(P=0.01)**	4.7	6.6	11.4	10.7	12.1	9.8	8.4	9.5
SIGNIFICANCE	*	**	**	**	**	**	**	**
TRIAL MEAN	5.9	11.0	15.8	14.3	15.8	14.6	13.3	11.5
S E MEAN	1.2	1.7	2.8	2.7	3.0	2.4	2.1	2.4
CV %	48.3	36.6	43.9	45.5	46.7	40.9	38.4	50.1

4.2 Table 2 Levels of infected whips (%) between 6 and 27 weeks (based on 155 000 millable stalks/ha)

TREATMENT	SEPT 29 6 wks	OCT 20 9 wks	NOV 10 12 wks	DEC 1 15wks	DEC 21 18 wks	JAN 12 21 wks	FEB 2 24 wks	FEB 23 27 wks
1	2.1	6.1	8.5	8.3	10.3	8.9	6.7	4.7
2	1.0	2.3	4.4	5.1	5.1	5.1	4.5	3.1
3	1.1	3.4	4.6	1.3	2.3	2.3	2.3	2.0
4	1.2	2.2	2.5	2.1	1.5	1.6	1.7	1.5
5	0.9	1.7	4.1	1.1	1.5	0.8	0.7	0.6
6	1.3	2.1	1.8	1.5	0.9	0.9	0.6	0.5
LSD(P=0.05)*	1.0	1.7	2.3	4.0	4.1	2.6	1.9	1.9
LSD(P=0.01)**	1.3	2.4	3.1	5.4	5.6	3.5	2.5	2.6
SIGNIFICANCE	*	**	**	**	**	**	**	**
TRIAL MEAN	1.3	3.0	4.3	3.2	3.6	3.3	2.7	2.1
S E MEAN	0.3	0.6	0.8	1.4	1.4	0.9	0.6	0.6
CV %	64.3	48.24	43.6	102.1	95.4	64.9	56.1	76.7

4.3 TABLE 3 Shoot (stalk) counts (x 1000/ha) at 6, 12, 18 and 24 weeks.

TREATMENT	SEPT 29 6 wks	NOV 10 12 wks	DEC 21 18 wks	FEB 2 24 wks	AUG 8 Harvest
1	421	555	426	268	161
2	378	575	421	272	171
3	369	547	405	291	161
4	387	578	423	278	165
5	374	507	361	253	168
6	335	559	369	243	169
MEAN	377	554	401	268	166

5. RESULTS (HARVEST)

5.1 Table 4. Cane yield, sucrose % cane and sucrose yield.

TREATMENT	TONNES CANE/HA	SUCROSE % CANE	TONNES SUCROSE/HA
1	110.7	15.8	17.5
2	118.8	16.0	19.0
3	108.0	16.2	17.5
4	120.0	15.9	19.0
5	126.3	15.9	20.1
6	129.0	15.7	20.2
LSD (P=0.05)*	19.3	0.4	2.8
(P=0.01)**	26.3	0.6	3.9
SIGNIFICANCE	*	*	N.S
TRIAL MEAN	118.8	15.9	18.9
S E MEAN	6.5	0.2	1.0
CV %	13.5	2.2	12.5

6. COMMENTS

6.1 Roguing Period

* Roguing was carried out by estate personnel using standard recommended practices.

* CV's were high particularly at the 3 weekly analysis of % smut whips.

* The variation in shoot (stalk) counts during the inspection period is due to the procedure of random selection of 2 x 5 metre sampling sites at each sampling date.

* The inspection before roguing commenced on September 29 indicated a residual benefit to roguing in the previous season.

* See Tables 1 and 2 for the effects of roguing treatment on the expression of smut.

  - Treatment 1 (Control) indicated the maximum infection level of the field to be over 30% stool infection. Peak expression appears to develop at about 15 - 18 weeks.

  - Treatment 2, the single roguing at 6 weeks dropped the smut level substantially to 8.9% at 9 weeks. Levels increased thereafter to approach control at 21 weeks.

- Treatment 3, reflected the 2 roguings at 9 and 15 weeks. Smut development was still evident up to 18 weeks.

- Treatment 4, initially lowered levels but did not reduce smut below an apparent threshold. (NB) Inspections are mades 3 weeks after roguing.

- Treatment 5, being 4 roguings at 6 week intervals allowed for an increase at 12 and 18 weeks but did provide better long term control.

- Treatment 6, was the most effective at lowering smut infection levels for the entire period.

* In a comparison of sample data between % stool and % whip infection there is close correlation which is as follows:

  Linear $Y = 0.30X-0.94$ $(r = 0.89)$

  Power $Y = 0.102X^{1.25}$ $(r = 0.93)$

  Where X = % stools infected (pop 13 333/ha)
  Y = % whips infected (pop 155 000/ha)

6.2 Harvest Results

* The tons cane yield per hectare indicated significant differences resulting from the roguing treatments and the trend was towards increasing cane yields with increasing levels of roguing.

* There was a slight difference in cane quality which appeared not to be associated with the treatments.

* The yield differences in tonnes sucrose per hectare were not significant but there appeared to be a distinct trend towards better yields with the high level of roguing.

* There was no detrimental affect on stalk populations at harvest from the heavy roguing treatments.

7. SUMMARY

7.1 Roguing

* The roguing treatments indicated conclusively that a significant reduction in the level of smut expression can only be achieved in a field with a high level of infection with a programme of sustained roguing throughout the season.

7.2 Harvest

* The results appear to indicate that the elimination of smut infected whips and stalks will result in an increase in cane yield.

* Intensive roguing appears to have little effect on quality or stalk populations at harvest.

8. 3 SEASON SUMMARY

8.1 Roguing Period

* Table 5 shows that no roguing benefit is carried over from one season to the next.

* The maximum smut level at 18 weeks appears to have been about 30% although the 1986/87 season peaked somewhat lower at about 20% indicating seasonal differences in smut expression (see Table 6).

* A distinct correlation exists between % stool and % whip infection which will allow for better comparisons between this industry and those of others where assessments are made only on % whip infection.

8.2 Harvest results

* Intensive roguing had no effect on millable stalks at harvest (see Table 8).

* The cane yield results produced a consistent trend in all 3 harvests (see Table 9) towards improved yields with intensive roguings. This yield response appears to have been gained in a field where the natural infection level is about 30% infected stools. This trend should be considered together with the results of SMUT 3/85 which show no response when smut levels are 15% or less.

Table 5 Initial levels of smut expression prior to the commencement of roguing treatments at 6 weeks.

	% STOOL INFECTION				% WHIP INFECTION			
TREATMENT	85/86	86/87	87/88	MEAN	85/86	86/87	87/88	MEAN
1	14.4	10.2	9.2	11.3	3.1	1.2	2.1	2.1
2	13.5	9.1	5.0	9.2	4.2	0.8	1.0	2.0
3	13.8	10.9	5.3	10.0	2.8	1.2	1.1	1.7
4	14.6	9.0	5.0	9.5	3.6	1.0	1.2	1.9
5	11.1	6.7	4.8	7.5	3.0	0.7	0.9	1.5
6	14.7	7.7	6.2	9.5	3.8	0.7	1.3	1.9

Table 6 Levels of smut expression at 18 weeks (following 12 weeks of roguing treatments)

	% STOOL INFECTION				% WHIP INFECTION			
TREATMENT	85/86	86/87	87/88	MEAN	85/86	86/87	87/88	MEAN
1	30.7	19.2	31.4	27.1	10.1	4.9	10.3	8.4
2	27.0	11.1	22.0	20.0	5.3	2.1	5.1	4.2
3	13.9	10.2	14.3	12.8	2.0	1.8	2.3	2.0
4	7.0	5.5	10.5	8.7	0.8	1.3	1.5	1.2
5	11.6	8.4	9.5	9.8	1.7	1.4	1.5	1.5
6	8.0	6.2	7.3	7.2	1.0	0.9	0.9	0.9

Table 7 Correlation and regression between % stool and % whip infection (Linear - $Y = a + bX$ and Power - $Y = aX^b$)

	LINEAR RELATIONSHIP				POWER RELATIONSHIP			
TREATMENT	1986	1987	1988	MEAN	1987	1987	1988	MEAN
a	-1.78	-1.07	-0.94	-1.26	0.053	0.103	0.102	0.86
b	0.34	0.29	0.30	0.31	1.47	1.21	1.25	1.31
r	0.94	0.91	0.87	0.91	0.97	0.97	0.96	0.93

Table 8 Stalk populations (1000/ha) at harvest

TREATMENT	85/86	86/87	87/88	MEAN
1	149	-	161	155
2	152	-	171	162
3	152	-	161	157
4	147	-	165	156
5	157	-	168	163
6	160	-	169	165
MEAN	153	-	166	160

Table 9 Yield at harvest (Tons cane per hectare)

TREATMENT	1986	1987	1988	MEAN
1	99.3	116.3	110.7	108.8
2	114.1	117.8	118.8	116.9
3	101.6	115.2	108.0	108.3
4	101.2	120.6	120.0	113.9
5	105.9	128.1	126.3	120.1
6	111.5	133.0	129.0	124.5
MEAN	105.6	121.8	118.8	115.4

TLP/cg
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