

# SMUT CONTROL BY ROGUING IN VARIETY NCo376

By J.G. de LANGE<sup>1</sup> and P. McGUGAN<sup>2</sup>

<sup>1</sup> South African Sugar Association Experiment Station, Private Bag X02, Mount Edgecombe 4300

<sup>2</sup> St Lucia Sugar Farms Ltd, PO Box 140, Mtubatuba 3935

## Abstract

The results of a comprehensive smut roguing programme in variety NCo376 on a large irrigated estate in the northern region are compared with the results of smut control measures of a nearby mill group, where roguing is conducted by only about 6% of growers.

The costs and benefits of roguing to control smut in the short and medium term are discussed.

## Introduction

The full value from roguing for smut control has not yet been appreciated by all growers. Smut is the most important disease in the northern region of the South African sugar industry and controlling this disease by roguing is cost effective.

Variety NCo376 is susceptible to smut but is cultivated in both the Pongola Mill Group area (Pongola) and on St Lucia Sugar Farms Limited Mkuze estate (SLSF Mkuze). Methods of smut control differ in the two areas and the resultant levels of smut in variety NCo376 are compared.

Pongola and SLSF Mkuze are approximately 50 km apart. The areas have similar soils, mainly Hutton and Shortlands soil forms, a similar climate and all the sugarcane fields are irrigated. At Pongola, the area under sugarcane is approximately 10 000 ha whilst at St Lucia Sugar Farms Mkuze the area under sugarcane is approximately 800 ha. In the 1987/88 season variety NCo376 contributed 20% of the total Pongola crop and 75% of the total SLSF Mkuze crop (SASA mill crushing figures).

The quality of irrigation water at Pongola is satisfactory whilst at Mkuze salinity and sodicity can be problems when water flow in the river is low. At times poor quality water has been used for irrigation. It could consequently be assumed that in periods of low water flow the cane at Mkuze may be more stressed due to salinity, particularly in the heavier textured soil profiles. During the 1987/88 season Mkuze experienced severe water shortages and the cane was badly stressed. Stressed cane is more likely to exhibit smut symptoms than cane adequately supplied with water.

## Method

During the 1987/88 season a survey was conducted at Pongola by the Pest and Disease Officer (P & DO) to determine the number of growers who were roguing to control smut. The results indicated that only about 6% of all the sugarcane fields in the Pongola area were being effectively rogued.

As a smut control measure, the Pongola Pest and Disease Control Committee (LP & DC) in 1985 removed the dominant but smut prone variety NCo376 from the list of varieties approved for planting. This meant that from 1985 no fields could be planted to variety NCo376, and the planting of more smut resistant varieties such as N14 and N17 was encouraged. Furthermore a deadline of 1990 was set for the complete eradication of variety NCo376 in the whole mill group area.

At SLSF Mkuze NCo376 is the dominant variety, but smut control measures are enforced by means of a disciplined, planned programme of roguing smut-infected cane stools in every field on three separate occasions during each season. In the plant crop all smut-infected stools are removed with a hand hoe. Ratoon crops are rogued by removing all smut whips, placing them in old fertilizer bags and destroying them away from the cane fields. Farm staff are trained each season in identifying smut and in roguing techniques by the Umfolozi Pest and Disease Control inspection team. A regular smut roguing team is used through the year on this task.

Random surveys to establish smut infection levels are conducted annually on an individual field basis at both Pongola and SLSF Mkuze by trained Local Pest and Disease Control Committee (LP & DC) teams. Both teams are closely supervised by the same P & DO, use identical survey methods, and all data are checked by the P & DO. It can therefore be assumed that survey data from the two areas are comparable.

## Results and Discussion

Survey data for the three seasons 1985/86, 1986/87 and 1987/88 are presented in Table 1 (SASEX disease survey reports).

Table 1  
Results of smut surveys conducted during 3 seasons at SLSF Mkuze (M) and Pongola (P)

Year	Mean % Smut in NCo376		Mean % Smut in all cane surveyed		% of total cane area surveyed		% of surveyed area under NCo376		% of surveyed area under N14	
	M	P	M	P	M	P	M	P	M	P
1985-86	0,6	4,4	0,5	2,1	33	20	86	40	13	44
1986-87	0,4	12,9	0,3	4,0	39	20	80	27	17	63
1987-88	0,4	7,1	0,4	2,5	10	27	100	20	0	71
3 Yr N/W* average	0,5%	8,1%	0,4%	2,9%	27%	22%				

\* N/W = Not weighted

The level of smut infection in NCo376 at Mkuze was consistently and substantially lower than the level at Pongola, despite the increasing area at Pongola under the relatively resistant variety N14. The level of smut in NCo376 at Pongola was well beyond the accepted threshold level at which the disease is considered to be virtually out of control, and without the mandatory introduction of more smut resistant varieties the smut situation would have been untenable.

The Zimbabwe sugar industry reports similar achievements in smut control to those of SLSF Mkuze, and their crop comprises 90% NCo376 (Anon<sup>3</sup>). Conversely, at Pongola it is now not unusual to find smut levels in excess of 5% in fields of the relatively newly released and smut resistant variety N14.

The annual cost of controlling smut by roguing can be redeemed directly through an increase in yield, and furthermore the control of smut can increase the number of ratoon crops grown. Where smut is controlled, more susceptible but higher yielding varieties may be grown in an area where smut would otherwise be a limiting problem. The alternative is continually to replace existing well-proven and high yielding varieties with increasingly resistant varieties with perhaps a lower yield potential. This is a very expensive option compared to a well managed control programme based on roguing.

Estimated yield losses due to smut under a range of conditions (Anon<sup>1</sup>) are shown in Table 2. For each area a yield loss of 0,25% is assumed for every 1% smut found in the surveyed fields in both areas, although in 1987/88 at Mkuze the yield loss could have been as high as 0,75% per 1% smut in some fields where the cane was stressed.

Table 2

Estimated yield losses due to smut under a range of conditions

Condition	% Yield loss per 1% smut-infected stools
Good irrigated	0,25%
Average rainfed	0,50%
Severely stressed	0,75%

Roguing costs in 1987/88 at SLSF Mkuze were R1,89/ hectare, with an average requirement of 2,6 mandays/hectare. The programme involved 10 to 12 fulltime staff to rogue smut in all fields over the period September to February each season. Therefore in 1987/88 the total cost of roguing 538 hectares was R6 396 (538 ha × R11,89).

If there were no roguing programme at SLSF Mkuze, it is likely that the level of smut in NCo376 would approximate that at Pongola. If this were the case, then SLSF Mkuze would have experienced a yield loss of 1,7% due to smut in 1987/88. This would have represented a total loss in revenue due to smut of at least R26 748 or R49,72/ha under variety NCo376. (See Appendix 1, calculations A and B for yield and revenue losses). This estimate of the potential loss is probably conservative because under conditions of moisture stress the yield loss could increase from 0,25% to 0,75% per 1% smut. Due to irrigation water shortages average yield of the estate in 1987/88 (76,1 tons cane/ha/annum) was considerably lower than in 1986/87 (104 tc/ha/annum) and 1988/89 (112 tc/ha/annum), and consequently calculated losses as a percentage of actual yield also make the estimated losses conservative for 1987/88.

The gains from roguing NCo376 at SLSF Mkuze can therefore be assumed to be at least R20 352 (additional rev-

enue R26 748 minus roguing cost R6 396) or R37,82 per hectare. This is a 320% return on investment.

If the Pongola Pest and Disease Control Committee constraints on NCo376 were applied to SLSF Mkuze, this would require the replanting of 538 ha of cane over a period of 5 years. The normal replant programme at Mkuze is 10% per annum but if by decree an additional 10% per annum of the area under NCo376 had to be replanted in order to achieve total eradication in 5 years, this would require an additional 53,8 ha to be replanted, costing R1 728/ha (Anon<sup>2</sup>) or a total of R92 966 per annum for a period of 5 years (see Appendix I, calculation c).

The total additional cost of eradicating 538 ha of NCo376 prematurely in 5 years at SLSF Mkuze would have been R464 832 (R92 966 × 5 years). However, under the LP & DC regulations NCo376 has not been removed from the approved list and the estate roguing programme has kept smut at acceptable levels, thereby avoiding the need for ploughout orders.

### Conclusion

The control of smut by effective roguing at SLSF Mkuze has resulted in savings by avoiding unnecessary yield losses caused by the disease, and obviating the need to replant a greater area than normal. In addition, a favoured and productive variety, NCo376, has been preserved. The introduction of more smut resistant varieties at considerable cost to the industry does not imply that roguing would no longer be required as a disease control measure, but rather that smut resistance should be considered a bonus resulting in less roguing effort required to maintain low smut levels. Without this effort on the part of management, the spectre of continued delisting of new varieties will remain, with the eventual possibility that only a very limited choice of highly smut resistant but possibly low yielding varieties would be available to growers.

Smut can be controlled by positive and timely action, and roguing is a simple effective method that will repay the costs incurred many times over.

### Acknowledgements

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### REFERENCES

1. Anon, *S Afr Sug Ass Exp Stn A Rep*: 1978/79; 1981/82; 1983/84.
2. *S Afr Canegrowers A Rep*: 6/6/87.
3. Anon, *Zimbabwe Sug Ass Exp Stn Rep*: 1986; 1987.

### APPENDIX I

**Calculation A:** Assumed 1987/88 additional yield loss due to increased smut levels at SLSF Mkuze because of no smut roguing programme.

7,1% mean smut level at Pongola less 0,4% mean smut level at SLSF Mkuze × 0,25% yield loss for 1% smut (irrigated crop) = 1,7% yield loss.

**Calculation B:** Revenue loss due to calculated yield loss at SLSF in 1987/88.

Area under NCo376	= 538 ha
Yield/ha/annum	= 76,1 tons cane
Total cane yield	= 538 × 76,1 = 40 941,8 tons
Estimated cane yield loss	= 40 942 × 1,7% = 696,0 tons
Actual value/ton cane	= R38,43
Revenue loss	= 696 tons × R38,43 = R26 748

Note: If the 1987/88 water shortage conditions are considered, the yield loss could have been 0,75% per 1% smut. In this case all calculated losses would be tripled.

**Calculation C:** Cost of enforced replanting of fields with more smut-resistant varieties over a period of 5 years.

Area under NCo376	= 538 ha
Normal replant area	= $10\% \times 538 \text{ ha} = 53,8 \text{ ha}$
Enforced replant area	= $20\% \times 538 \text{ ha} = 107,6 \text{ ha}$
Additional replant area	= 53,8 ha
Additional cost per annum	= $53,8 \text{ ha} \times \text{R}1\,728 = \text{R}92\,966$
Total additional cost	= $5 \text{ years} \times \text{R}92\,966 = \text{R}646\,832$