THE EFFECT OF LIMING ON WHITEGRUB NUMBERS IN THE MIDLANDS AREA OF THE SOUTH AFRICAN SUGAR INDUSTRY

D G MCARTHUR

Union Co-operative Limited, PO Box 1, Dalton, 3236, South Africa

Abstract

It has been suggested that raising soil pH through liming could reduce the impact of whitegrub on crop yield in the treated soil. To test this hypothesis, whitegrub incidence was monitored in a trial designed to examine the effects of various lime treatments on crop yields of varieties N16 and N12.

Lime was applied at two rates (5 and 10 t/ha) and in combination with gypsum at 5 t/ha each. Results showed that, for N16, crop yield increased from 62 tons cane/ha (control) to 93 tons cane/ha (10 tons lime/ha treatment), and ERC increased from 6.4 to 10.8 tons sucrose/ha. Values for N12 were 85 tons cane/ha (control) to 87 tons cane/ha (10 tons lime/ha treatment). ERC increased from 10.3 to 11.5 tons sucrose/ha.

The aluminium saturation index (a measure of the impact of liming on soil pH) declined from 80% (control) to 20% (10 tons lime/ha treatment). However, no significant decrease or increase in white grubs numbers was recorded from any of the treatments. In the control plots, mean counts of 21.2 grubs per sample were recorded, while counts of 18.8 grubs were recorded in the highest lime treatment (LSD 8.9).

These results show that, although crop yields responded positively to the lime treatments, there was no clear association between the lime treatments and the number of whitegrub recovered. It is concluded that liming has no significant effect on the incidence of whitegrub.

Introduction

It has been asserted that the use of very high levels of lime eliminates whitegrub, and represents a logical control measure which has the additional advantage of correcting the balance of soil nutrients. However, in an industry-wide survey Way (1999) could find no clear correlation between whitegrub numbers and soil pH.

In 2001 there was an outbreak of whitegrub in the New Hanover, Seven Oaks and Blinkwater areas of the KwaZulu-Natal Midlands. This presented an opportunity for a lime calibration trial, situated in the middle of this area, to be used to examine the relationship between aluminium saturation index (ASI), soil pH and whitegrub numbers.

Methods and materials

Whitegrub counts were carried out on a lime calibration trial at Dalton, previously reported by Schumann *et al.* (1999) and Nixon *et al.* (2003). The design was a split plot, five replicate latin square (4 x 5) with varieties N12 and N16 balanced in columns. The main treatments applied at planting were control (no lime), 5 and 10 tons dolomitic lime/ha, and a combined treatment of 5 tons dolomitic lime and 5 tons gypsum/ha.

Three pits (20x20x20 cm) per plot were dug, and the grubs recovered from the pit soil were classified visually as being small, medium or large in size. Sampling was conducted in April 2001, immediately following harvest. Grub numbers are presented as totals from the three pits.

Mean ASI and pH levels were also obtained from topsoil samples taken in 1998 and 2001, before and after the crop.

Results

The results in Table 1 show trends in ASI, soil pH, crop yield parameters and grub numbers.

Table 1. Cane yields and whitegrub numbers in the third ratoon in the Dalton lime trial.

Treatment (tons/ha)	Variety	Mean ASI (%)	Soil pH	Cane (t/ha)	ERC (t/ha)	Grub class			Total grubs
						Small	Medium	Large	
Control	N16	74	4.19	62	6.4	1.8	5.4	11.2	18.4
5 t lime		47	4.52	73	8.5	4.4	6.0	7.8	18.2
5 t l + 5 t g		45	4.44	94	10.3	3.8	8.8	7.6	20.2
10 t lime		21	4.81	93	10.8	2.6	4.4	11.8	18.8
Control	N12	74	4.19	85	10.3	3.8	7.2	10.2	21.2
5 t lime		47	4.52	88	11.5	3.8	7.2	8.2	19.2
5 t l + 5 t g		45	4.44	101	13.3	4.2	4.4	5.8	14.4
10 t lime		21	4.81	87	11.5	3.8	6.8	8.2	18.8
LSD 0.05				**19**	**2.1**	**3.9**	**5.0**	**6.5**	**8.9**
N16				82	10.1	3.2	6.2	9.6	18.9
N12				90	11.7	3.9	6.4	8.1	18.4
LSD 0.05				**8.9**	**1.0**	**2.3**	**0.5**	**2.7**	**3.5**

As shown in Table 1, the main treatments resulted in mean ASI levels of 74, 47 and 21% for both varieties, with the lime/gypsum treatment producing an ASI of 45%. Measurement of soil pH increased from 4.19 to 4.81 over the same treatments and, as expected, inversely to the ASI as levels of lime increased.

The normal trend of a response to lime in N16 and non-responses in N12 is evident. However, in the first three crops N16 outyielded N12 by more than 10% on each occasion, whereas the opposite is the case here. The biggest single reversal in yield occurred in the lime-gypsum treatment.

Whitegrub numbers were high, and their incidence fairly uniform throughout the plots. From this it is inferred that none of the treatments had any effect on the incidence of whitegrub. This is also true (with one exception, see counts of medium-sized grubs from N16) when the grubs were classified and analysed according to size.

Discussion and conclusion

The generally consistent numbers of whitegrub across treatments clearly indicates that rate of lime applied and variety did not affect grub numbers, despite the clear effect of the treatments on the ASI and soil pH. The one exception (high numbers of medium sized grubs in N16 in the lime/gypsum treatment with intermediate ASI levels) explains in part the drop-off in yield in this treatment, which in the first two crops produced top yields.

Such results strongly indicate that the use of lime in no way influences the incidence of whitegrub.

Acknowledgements

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