SHORT, NON-REFEREED PAPER

NUTRIENT MANAGEMENT OPTIONS FOR REDUCING *ELDANA SACCHARINA* (LEPIDOPTERA: PYRALIDAE) INFESTATION OF TRASHED SUGARCANE FIELDS: RESULTS FROM A PRELIMINARY STUDY

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Abstract

The objective of this study was to examine the impact on *Eldana saccharina* infestation of trashing and various levels of nutrient supply. Data originated from the long-term BT1 trial and included third leaf nutrient analyses, and *E. saccharina* field surveys that recorded damaged cane internodes. The treatments in BT1 included various combinations of trashing, burning and fertilising, with the green leaves (tops) after harvest either spread or removed for the burnt treatments only. The fertilised plots each received 140 kg N and K/ha and 30 kg P/ha after harvest. The data revealed that internodes damaged by *E. saccharina* were highest in the trashed plots that were fertilised. In these treatments leaf N was highest and leaf Si lowest. In contrast, internode damage was lowest for the burnt plots that were not fertilised, where leaf N was low and leaf Si high. This suggests a relationship between the plant nutrient levels and the pest incidence. Two sugarcane nutrient management options are thus suggested for *E. saccharina* control, especially in trashed fields: lower N fertiliser and/or increased Si supply to the crop. *E. saccharina* infestation is substantially reduced where leaf Si contents are higher than 1.8%. To increase leaf Si to this level could be costly, and it is assumed that growers would prefer the alternative which is to lower N applications to keep leaf N contents below 2.1%.

Keywords: BT1, *Eldana saccharina*, stalk borer, sugarcane, leaf N, leaf Si

Introduction

Eldana saccharina is a stalk borer causing yield losses of approximately R200 million/annum in the South African sugar industry. Once the borer is in the stalk it is very difficult to control. The South African Sugarcane Research Institute (SASRI) is therefore constantly searching for management options to reduce infestation.

Sugarcane with a high concentration of N in the plant is likely to be infested with *E. saccharina* (Keeping and Meyer, 2006). In contrast, plants with a high Si content are more resistant to *E. saccharina* infestation and damage.

The South African sugar industry promotes trashing (green cane harvesting) as it enhances cane yields (in particular in coastal areas), improves soil conditions and eliminates the nuisance factors associated with cane fires. In addition, it provides a stable habitat for epigeal predators. Typical trash yields (brown plus green trash) range from 5 to 20 t/ha, with a general composition of 0.35% N, 0.25% Ca and 0.15% K. The typical trash yield for a crop that has produced 70 tons cane/ha is about 13 tons trash/ha, with a total N content of approximately 27 kg/ha.

Materials and Methods

All samples and data were collected from the burning and trashing trial (BT1) at Mount Edgecombe (leaf samples taken in January and *E. saccharina* surveyed in September). The trial was established in 1939 on a vertisol soil containing 50% clay, 3.8 to 4.1% organic matter and pH (water) ranging from 4.8 to 5.9, depending on the treatment (van Antwerpen and Meyer, 1998). The treatments in BT1 include various combinations of trashing, burning and fertilising, with the green leaves (tops) after harvest either spread or removed for the burnt treatments only. The fertilised plots each receive 140 kg N and K/ha and 30 kg P/ha after harvest. Third leaf analysis was conducted for N% (using near infra-red), P%, K%, S%, Ca%, Mg% and Si% (using X-ray fluorescence). *Eldana saccharina* damage assessment was obtained from 21 stalks/plot, and total internodes and total internodes damaged were counted and the internode damage % calculated.

Results and Discussion

There was an obvious separation of leaf data into two groups: those treatments that had received fertiliser (F) and those that had not (Fo). N, P, K and S were higher in the leaves coming from the F group. Ca, Mg and Si, not applied with fertiliser, were highest in leaf samples coming from the Fo group (Figure 1). Of these nutrients only N, P and K from the non-fertilised plots were deficient in the leaf.

A plot of *E. saccharina* damage to cane stalks versus leaf N is presented in Figure 2 (top). A vertical line at 2.1% N, together with a horizontal line at the 5% damaged internodes level, reveals a general separation in the data: nearly all the points from the F treatments were in the upper right quadrant and those from Fo treatments in the lower left quadrant (the leaf N threshold value is 1.8%). These data indicate that *E. saccharina* damage to cane increased significantly when leaf N was higher than 2.1%.

Indicators are that leaf N should be ‘scheduled’ to avoid surpluses, especially in trashed fields. The lower level of this band should be the threshold value (1.8% in this case) and the upper level should be about 2.1%. Above this level *E. saccharina* damage increased tremendously. This work was conducted at Mount Edgecombe and it is uncertain what this upper level would be for other areas within the sugar industry or for other varieties.

A plot of *E. saccharina* damage to cane stalks versus leaf Si is presented in Figure 2 (bottom). Drawing a vertical line at 1.8% Si reveals that nearly all the points from the F plots were on the lower end of the scale and those to the right were from the Fo treatment (Figure 2). The leaf Si threshold value is about 1% (du Preez, 1970). Again drawing a horizontal line at the 5% damaged internodes mark on the vertical axis reveals that nearly all the points from the F treatments were above, and those from Fo below this line. Thus, *E. saccharina* damage to cane was significantly less where leaf Si was higher than 1.8%.

A possible critical leaf Si level is thus 1.8%, above which *E. saccharina* damage to cane stalks was markedly reduced. This level is, however, far above the current leaf threshold value of 1% Si required for normal crop development. To increase leaf Si to 1.8% to reduce *E. saccharina* damage would be very costly on certain soils.

Conclusions

The BT1 trial presents a unique opportunity to investigate the N x Si x *E. saccharina* interaction *in situ*. Despite the relatively small size of each plot (18 m x 9.8 m) *E. saccharina* damage to cane stalks was affected by the treatments; the latter also had an effect on leaf N and Si contents.

To manage *E. saccharina* in particular, it is suggested that leaf N should be kept in the narrow band between the threshold value and 2.1%, while leaf Si should be kept as high as possible (at least it should not be allowed to fall below the threshold value of 1%).

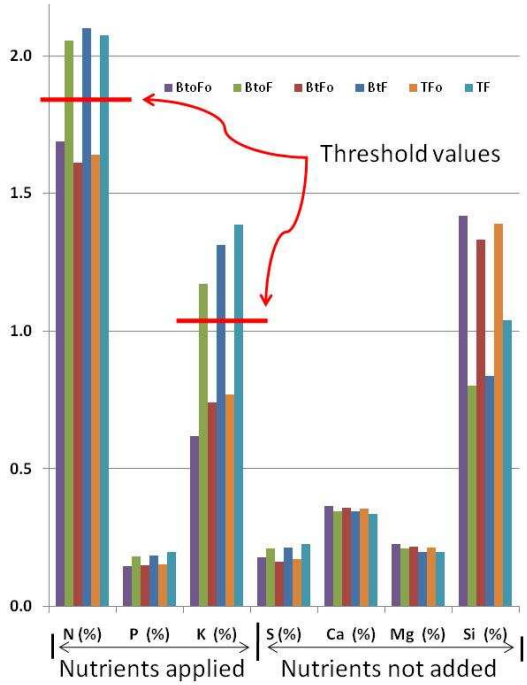

Figure 1. The effects of fertiliser and trashing on the nutrient content of sugarcane leaves.

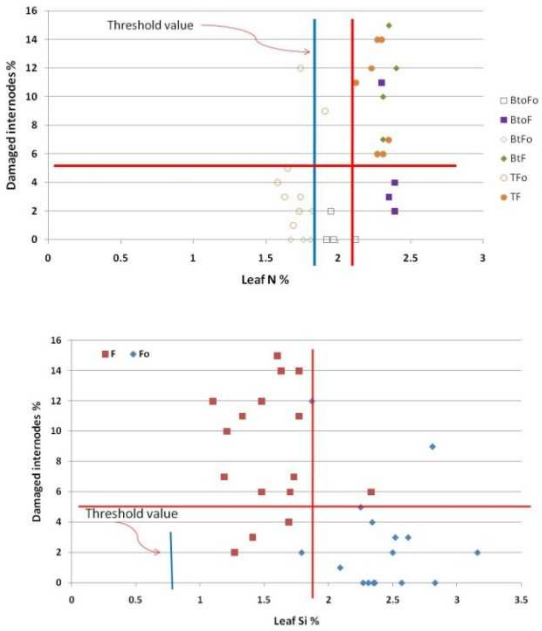

Figure 2. The effect of leaf N (top) and Si (bottom) contents on stalk damage by *Eldana saccharina*.

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