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## Introduction

- Approximately 70% of the productive varieties in the Australian sugarcane industry were susceptible to sugarcane smut caused by *Sporisorium scitamineum* prior to an incursion of the disease in 2006 (Croft *et al.*, 2008).
- Previous research showed that 10-15% of progeny from two highly susceptible parents may be resistant to smut (Chao *et al.*, 1990).
- A program has been undertaken by BSES to recover smut resistant clones from high value smut susceptible crosses.
- As part of the program approx. 40,000 seedlings from susceptible crosses are being screened for smut in two phases.
- There is no widely accepted inoculation method to screen true seedling against sugarcane smut.
- The aim of this research was to develop an inoculation method for true seedlings which would provide a reliable indication of the field resistance.

## Method

- Two experiments were established at the BSES smut research farm, Bundaberg, Queensland in 2007 and 2009 to examine methods of inoculation of seedlings from fuzz or true seed (Figure 1 a).
- The treatments were, (i) dip four-week-old seedlings (dip inoculation) in smut spore suspension ( $1.5 \times 10^6$  spore/mL water), (ii) trim and spray of 4-week-old seedling with smut spore suspension, (iii) natural spread by planting seedlings between infected spreader rows, and (iv) spray germinating seedlings (two days old, Figure 1 b) with smut spore suspension.
- The control was a random selection of 50 seedlings from each family which were grown to maturity in an area with low smut disease pressure and setts cut from mature stalks were dip inoculated using standard smut screening methods.
- Fifty seedlings from 12 families with three resistant categories, susceptible, intermediate and resistant were included in each method.
- Incidence of smut (% of infected plant) was assessed at two to three months intervals for a plant and first ratoon crop.

## Results and discussion

- The results from both years' trials indicated that dip inoculation was the most effective for screening true seedlings against sugarcane smut (Figure 2 and 3).
- There was a highly significant correlation ( $r=0.75 - 0.91$ ,  $<P0.001$ ) between percent smut infected seedlings and mid-parent rating in the dip inoculation method (Fig 4). Correlation coefficients were less for other methods, (i)  $r=0.33$  for spray 2 day old seedling, (ii)  $r=0.68$  for natural infection, and (iii)  $r=0.32$  for spray 4 week old seedlings.
- Natural infection was effective but requires more time and considerably larger areas.
- Dip inoculation method has been adopted for screening sugarcane seedlings against smut.



Figure 1: Sugarcane seeds (fuzz) (a), germinating seedlings (b), smut infected seedling in the field (c).

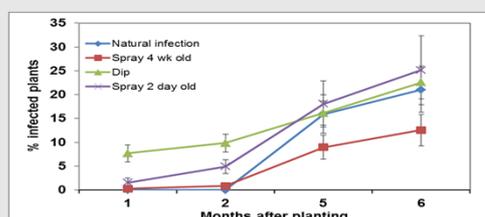


Figure 2: Disease development on sugarcane seedling inoculated using various methods in 2007.

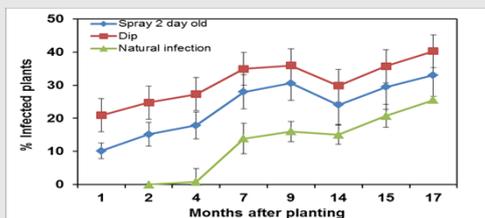


Figure 3: Disease development on sugarcane seedling inoculated using various methods in 2009.

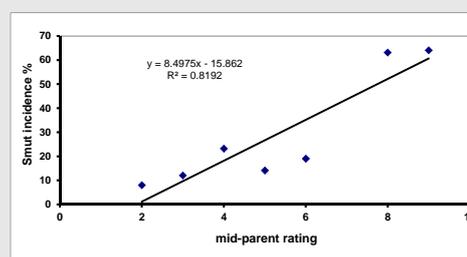


Figure 4: Relationship between mid-parent smut rating and incidence of smut on seedlings using dip inoculation method in 2007.

## References:

- Croft BJ, Berding N, Cox MC, Bhuiyan S. 2008. Breeding smut-resistant sugarcane varieties in Australia: progress and future directions. *Proc. Aust. Soc. Sugar Cane Technol* 30, 125-134.
- Chao CP, Hoy JW, Saxton AM, Martin FA. 1990. Heritability of resistance and repeatability of clone reactions to sugarcane smut in Louisiana. *Phytopathology* 80, 622-626.