SHORT COMMUNICATION

APHID POPULATION DYNAMICS IN THE NORTHERN IRRIGATED REGIONS OF THE SOUTH AFRICAN SUGARCANE INDUSTRY AND ITS INFLUENCE ON THE SPREAD OF *SUGARCANE MOSAIC VIRUS* AND *SUGARCANE YELLOW LEAF VIRUS*

McFARLANE SA, BUTHELEZI GK and RUTHERFORD RS

South African Sugarcane Research Institute, Private Bag X02, Mount Edgecombe, 4300, South Africa
sharon.mcfarlane@sugar.org.za khanyisile.buthelezi@sugar.org.za
stuart.rutherford@ sugar.org.za

Abstract

Aphid populations were monitored in plots of sugarcane planted at monthly intervals near Komatipoort and Pongola. The incidence of *Sugarcane mosaic virus* (SCMV) and *Sugarcane yellow leaf virus* (SCYLV) within the plots was also recorded. Aphids were trapped at both sites throughout the year. More aphids were trapped at Pongola where populations were highest from November through February, while populations peaked in February at Komatipoort. *Melanaphis sacchari*, a vector of SCYLV but not of SCMV, was the most common aphid species identified at Pongola. SCYLV infection was extensive at this site. *Hysteroneura* and *Rhopalosiphum* species were more common than *M. sacchari* at Komatipoort where the incidence of SCMV was higher than at Pongola. *H. setariae* and *R. maidis* are known to be efficient vectors of SCMV. These findings indicate that it is possible to limit but not prevent the spread of SCMV at Komatipoort by avoiding the planting of susceptible varieties between November and the end of January. Field data collected since 2000 show mosaic incidence to be highest in December/January planted plots. SCYLV incidence was high in plots planted from August to February in Pongola and increased substantially at Komatipoort after one harvest. Planting time would appear to be less effective in limiting the spread of this disease.

Keywords: aphids, *Sugarcane mosaic virus* (SCMV), *Sugarcane yellow leaf virus* (SCYLV), disease transmission

Introduction

Sugarcane mosaic virus (SCMV) and *Sugarcane yellow leaf virus* (SCYLV) are spread by aphid vectors and by planting infected seedcane. *Rhopalosiphum maidis* and *Hysteroneura setariae* are the most common species involved in SCMV transmission (Pemberton and Carpentier, 1969), while *Melanaphis sacchari* is the most important and efficient vector of SCYLV (Schenck and Lehrer, 2000).

Sugarcane mosaic virus has been shown to cause yield losses of up to 42% in the mosaic-susceptible variety NCo376 (Bailey and Fox, 1987). Although SCYLV does not appear to have had an adverse effect on commercial varieties currently growing in South Africa, the disease reduced ERC yield by 40% in a widely grown variety in Brazil (Lockhart and Cronjé, 2000). Previous research on aphid transmission of viruses in the South African sugar industry focused on mosaic in the southern parts of KwaZulu-Natal. Based on this research, growers were advised against planting and harvesting mosaic-susceptible varieties from mid-October to the end of January, thus avoiding having young cane growing during the period of peak aphid activity (Bailey and Fox, 1980; Harborne, 1988).

After an outbreak of SCMV in Mpumalanga in 2000 and due to the rapid spread of SCYLV at the SASRI Research Station at Pongola, a study on the aphid populations that occur in these areas was undertaken. Periods of rapid SCMV and SCYLV spread were also investigated in order to refine and build on the current recommendations for the management of virus diseases in the northern irrigated regions of the industry.

Procedure

Field trials were established at the SASRI Research Stations near Komatipoort and Pongola to monitor the rate of spread of SCMV and SCYLV in plots planted at monthly intervals, from August 2005 to March 2006. The plots were cut back at 12 months from August 2006 to March 2007. Plots were inspected for SCMV and tested for SCYLV infection from October 2005 to May 2006. The 1R plots were inspected and sampled once more in May 2007. Aphid numbers were monitored using yellow, cylindrical impaction traps. Ten traps were erected around each of the trial sites, and a further five were positioned along a field edge at sites near Barberton and Malelane. The traps were changed on a fortnightly basis. Aphids were counted for a period of one year at Barberton and Malelane and three years at the SASRI Research Stations. *Melanaphis sacchari, Rhopalosiphum* sp and *Hysteroneura* sp numbers were monitored at the two trials sites.

Results and Discussion

Aphid numbers were highest at Pongola and lowest at Komatipoort in the 2005/06 season (Figure 1). High numbers were recorded at Pongola from November through February, peaking in January and declining rapidly in March. Numbers peaked in February at Komatipoort and Barberton, and in January in Barberton. Although tending to decline after these peaks at the three sites in Mpumalanga, numbers rose again slightly in autumn.

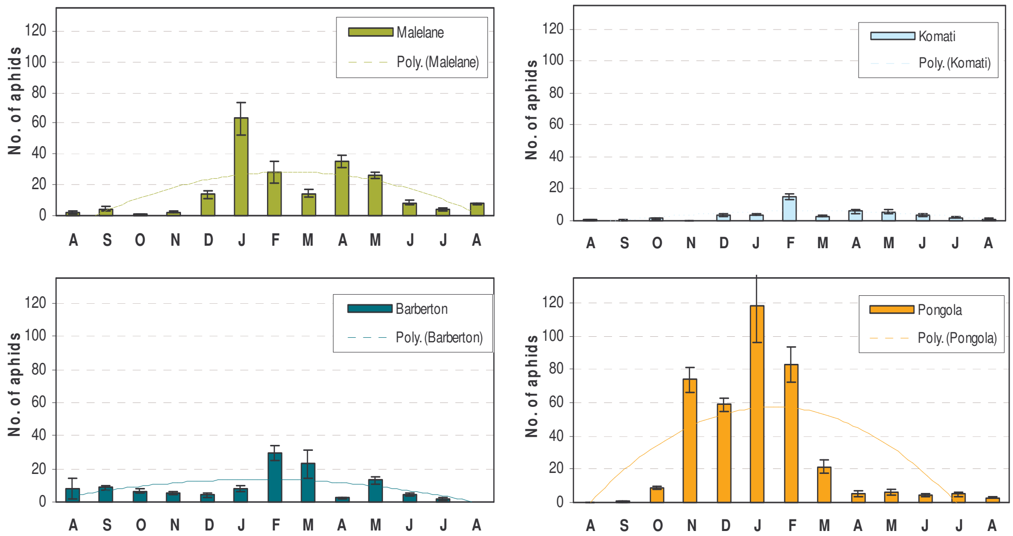

Figure 1. Aphid numbers at four sites in the northern irrigated region of the South African sugar industry (August 2005 to August 2006).

Aphids were trapped throughout the year at both trial sites (Figure 2). Aphid numbers were extremely high from November through February in 2005/06 at the Pongola site, but were lower in subsequent years, although summer peaks were still evident. *Melanaphis sacchari*, a vector of SCYLV but not of SCMV, was the most common aphid species identified at Pongola (Figure 2c). While SCMV incidence was extremely low in 2005/06 (maximum 1% stools infected in the January-planted plots), SCYLV infection was extensive in all but the March planted plots. No mosaic was observed in 2006/07 but SCYLV levels had increased in all plots. The rapid spread of SCYLV through the Plant Breeding selections at the Pongola Research Station can be attributed to the high populations of *M. sacchari* at the site. Based on these results it is unlikely that planting date will have an effect on SCYLV incidence in Pongola.

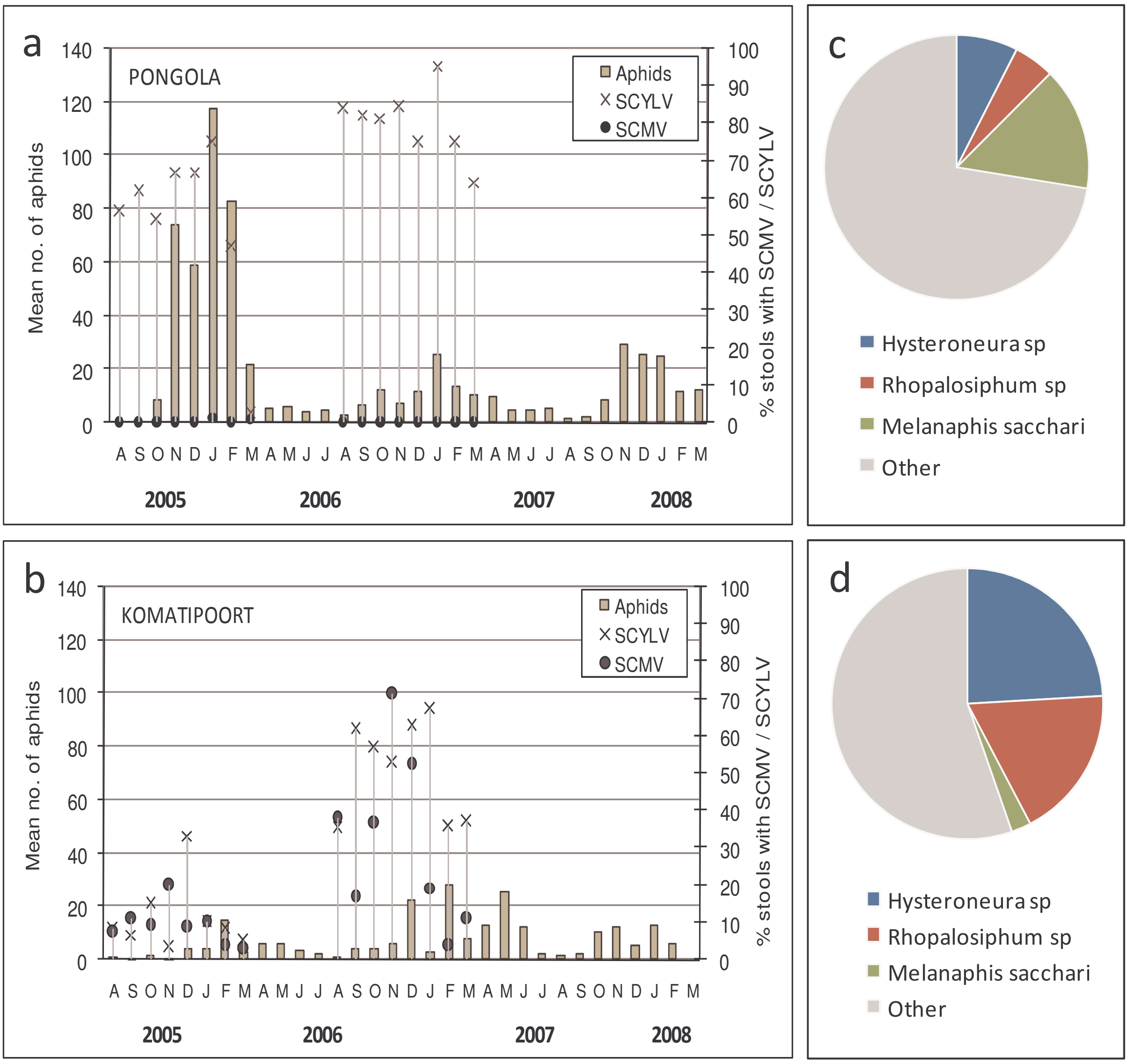

Figure 2. Aphid numbers and SCYLV and SCMV levels in plots planted at monthly intervals from August 2005 to March 2006 at the Pongola (a) and Komatipoort (b) Research Stations. Each plot was harvested at 12 months from August 2006 to March 2007; Proportion of different aphid species trapped in the Pongola (c) and Komatipoort (d) trial sites.

Although aphid populations were low in the 2005/06 season at the Komatipoort site, numbers increased in 2006/07 and persisted into autumn (Figure 2b). *Hysteroneura* and *Rhopalosiphum* species, some of which are efficient vectors of SCMV, were more common than *M. sacchari* at Komatipoort (Figure 2d). The incidence of SCMV was higher at this site than Pongola with most spread occurring in the plots planted and harvested in November and December 2006, and low levels in the February and March planted plots (Figure 2b). SCYLV spread was highest in the December-planted plots and increased substantially in the first ratoon, with incidence highest in the plots harvested from September 2006 to January 2007. SCMV spread was highest in the November-December-harvested plots and lowest in the plots harvested in February and March 2007.

These findings suggest that it is possible to limit but not prevent the spread of SCMV at Komatipoort by avoiding planting susceptible varieties between November and the end of January. Aphid peaks occurred at similar times in Malelane and Barberton and data from the Lowveld Local Pest, Disease and Variety Control Committee surveys since 2000 indicate that most SCMV transmission occurred in December/January planted plots. The recommendation to avoid planting mosaic-susceptible varieties from November through January in Mpumalanga should continue to be applied.

Acknowledgements

Sincere thanks to Mr J Visser (Jeddo Stoetery, Barberton) for permission to place aphid traps on his farm.

REFERENCES

Bailey RA and Fox PH (1980). The susceptibility of vrieties to mosaic and the effect of planting date on mosaic incidence in South Africa. *Proc S Afr Sug Technol Ass* 37: 120-126.

Bailey RA and Fox PH (1987). A preliminary report on the effect of sugarcane mosaic virus on the yield of sugarcane varieties NCo376 and N12. *Proc S Afr Sug Technol Ass* 61: 1-4.

Harborne K (1988). Population dynamics of the main aphid vectors of sugarcane mosaic virus in Natal. *Proc S Afr Sug Technol Ass* 62: 195-198.

Lockhart BE and Cronjé CPR (2000). Yellow leaf syndrome. pp 292-295 In: P Rott, RA Bailey, JC Comstock, BJ Croft and AS Saumtally (Eds), *A Guide to Sugarcane Diseases*. CIRAD-ISSCT.

Pemberton CE and Carpentier LJ (1969). Insect vectors of sugarcane virus diseases. pg 411-425 In: JR Williams, JR Metcalfe, RW Mungomery and R Mathers (Eds), *Pests of Sugarcane*. Elsevier, New York, USA.

Schenck S and Lehrer AT (2000). Factors affecting transmission and spread of *Sugarcane Yellow leaf virus*. *Plant Dis* 84: 1085-1088.