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Weed management in sugar cane: critical periods of weed competition and mechanisms of interference from *Paspalum paniculatum* and *P. urvillei*

by

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Department: Plant Production and Soil Science
Degree: PhD Agronomy

SUMMARY

The aim of this project was to provide sound scientific underpinning for the development of new weed management strategies in sugar cane by exploring competition from the major weeds, and explaining the different mechanisms of weed interference from *Paspalum paniculatum* and *P. urvillei*.

Critical periods of weed control (CPWC) were studied in six field trials. In ratoon cane, CPWC with natural weed infestations started between 228 and 916 GDD, and ended between 648 and 1311 GDD, depending on the site and cane variety. These results represented a maximum CPWC of 12 to 28 weeks after harvest (WAH). In plant cane, the CPWC started earlier (6 WAP) and was longer than those in ratoon cane.

Relative competitiveness 'q' values of eight common weed species showed that sugar cane was a stronger competitor than most of the weeds tested. The adverse effect of weed competition in sugar cane is not experienced before several weeks following weed emergence. The competitiveness of both *P. paniculatum* and *P. urvillei* was found to remain unchanged with time within the first nine weeks after transplanting (WAT). A reduction in their competitiveness was recorded from 13 WAT, mainly explained by the distribution of the leaves within the canopy.

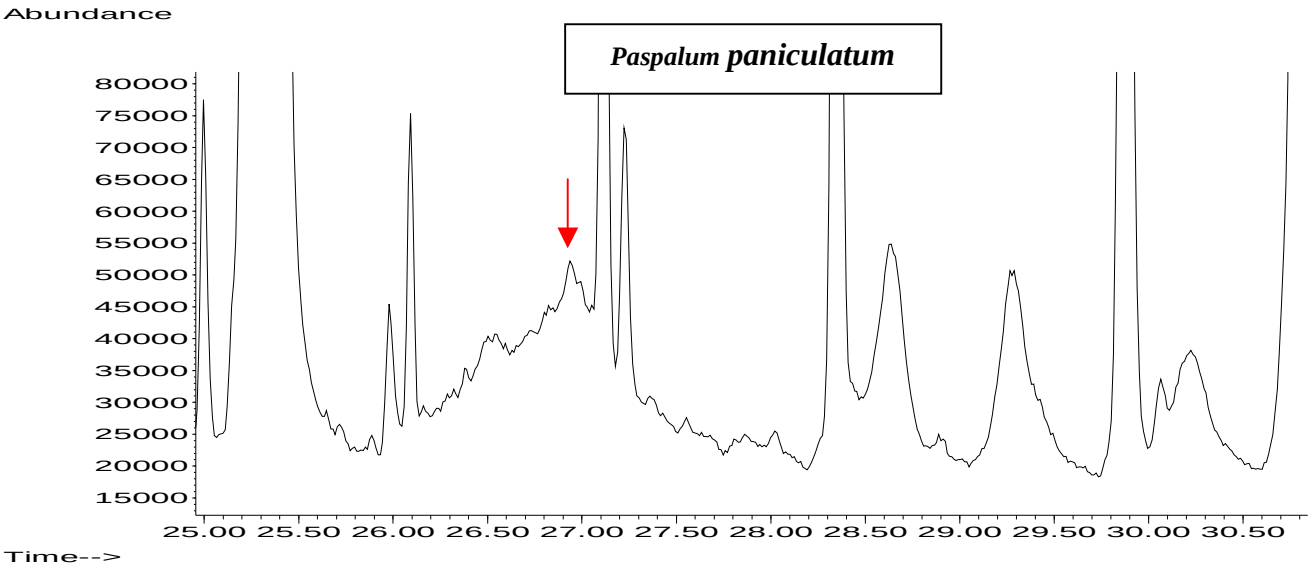
Trials, studying two timings of weed emergence, revealed that transplanting weeds later caused no significant change in cane yield response. However, measurements made after the second transplanting showed some significant reduction in the total cane dewlap height. Due to its long

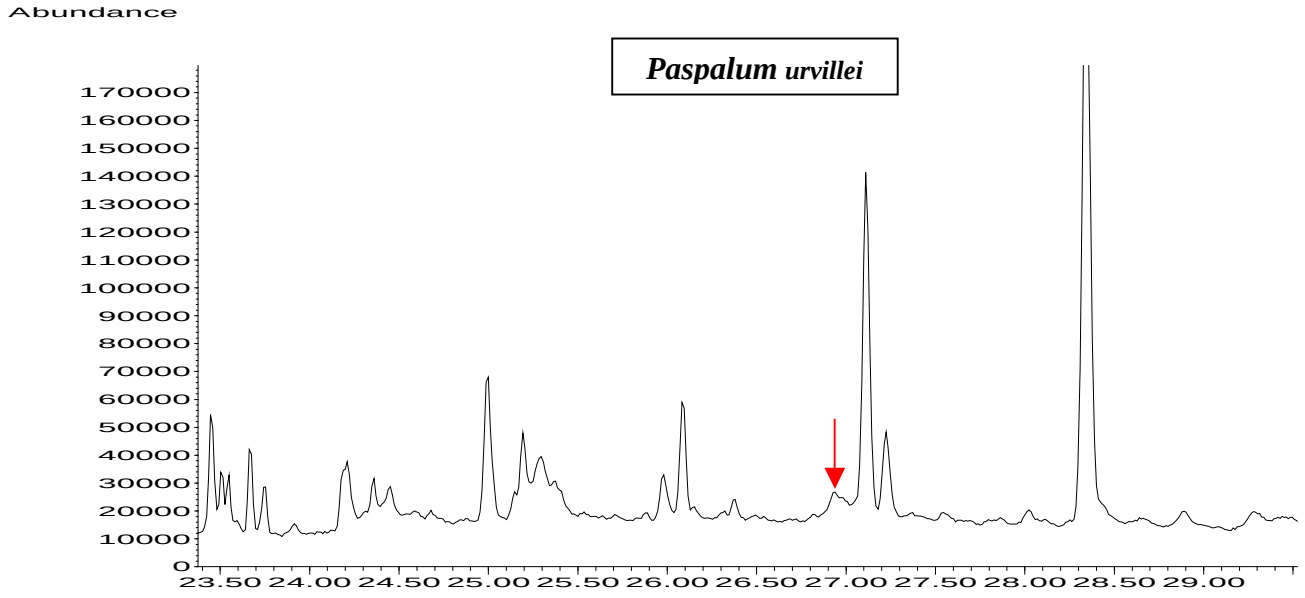
growing period sugar cane has the ability to recover and compensate for some impediments caused by weeds.

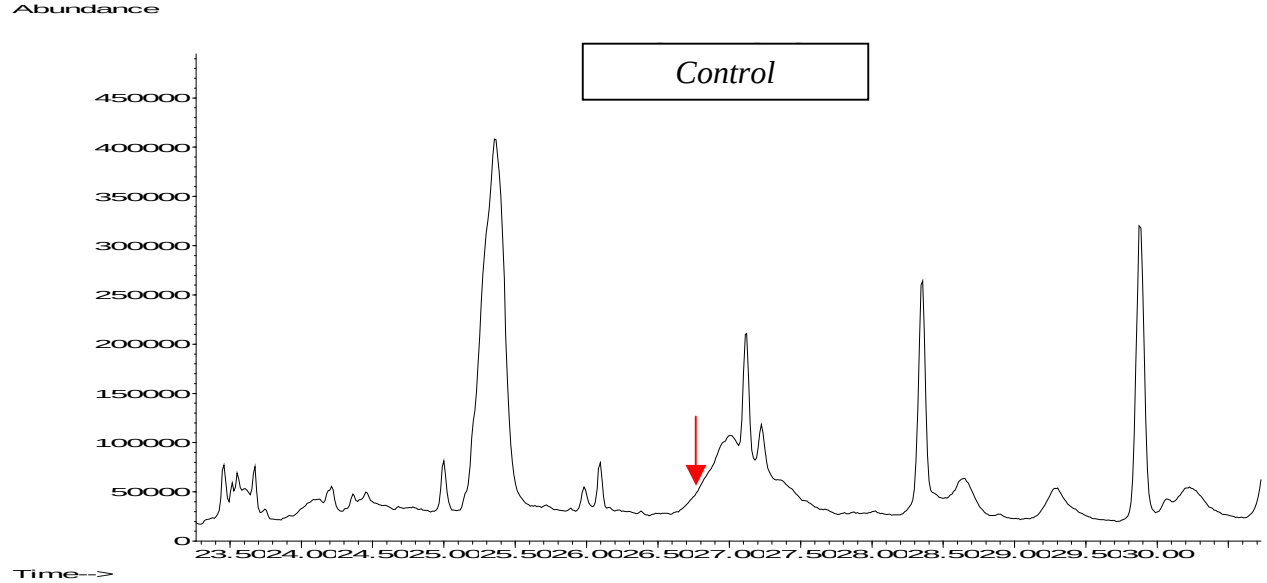
Paspalum paniculatum was often found to be more competitive than *P. urvillei*, although the latter produced more leaf area and grew taller to intercept more light within the canopy. This indicated that other mechanisms of weed interference might be involved and that competition for light was more important during the earlier (tillering) growth stages. Root competition was shown to be as important as shoot competition. Root competition effects were observed several weeks after imposing competition, when cane stalks reached more than 35 cm in dewlap height, suggesting that root competition was more important than competition for light after the post-tillering phase. The shoot versus root competition trials were not able to completely explain the higher relative competitiveness of *P. paniculatum* compared to *P. urvillei*. Application of root exudates from the two grasses to sugar cane confirmed an allelopathic effect on the root biomass of sugar cane. One chemical identified for the allelopathic effects was 2-propenoic acid, 3-(4-methoxyphenyl).

The main implications of the above findings for the Mauritian sugar industry would be to delay the first treatment until onset of the first flush of weeds. A new tank-mix consisting of trifloxysulfuron+ametryn and amicarbazone has been studied and was found to meet this objective. This strategy will enable a savings of at least one herbicide treatment per season.

APPENDIX 1







Chromatograms from leachates (root exudates) collected from *P. paniculatum* and *P. urvillei* showing peak for 2-propenoic acid (RT: 26.95 mins)