Environmental and varietal factors predisposing to suckering in sugarcane in the wet tropics

Thesis submitted by

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ABSTRACT

A recent review of the trends in productivity of sugarcane grown in the wet tropics of Australia revealed a decline in sugar content at the mill. Many factors were implicated in this decline. Sugarcane suckers are shoots that appear when the original stalks produced by the crop are more or less mature. Suckers are harvested along with the mature stalks in crops that are mechanically harvested. The low sugar content of suckers, due to their immaturity, causes dilution of the sugar content of the harvested material. Suckers also increase the amount of extraneous matter in the harvested material, this results in further dilution of the sugar content. Farmers are paid on a formula which is biased towards high sugar content. The additional yield, as a result of sucker growth, does not outweigh the loss due to the lower sugar content of the crop. This results in a loss of profitability. Little was known about suckering in sugarcane. The few observations that exist in the literature are mostly speculative. That meant that there was a need to better describe suckering and to establish what environmental factors cause it.

Sugarcane suckers of three cultivars were found to have different morphology to normal stalks of similar age. Suckers had greater maximum breadth of the leaf lamina, longer leaf sheaths, produced their leaves at a greater height above ground and had thicker internodes. When allowed to grow, the buds produced on a sucker did not posses this altered morphology, which indicted that the change in morphology was transient. Gene expression in the apex of sucker stalks was also found to be different to that of normal stalks, which provides further evidence for the differences between the stalk types and

could potentially provide some evidence as to why these differences occur. Some evidence was found for the translocation of sucrose from the mature parent stalk to a young developing sucker. This matter needs to be investigated further as mature stalks may lose substantial amounts of sucrose to sucker stalks even before dilution occurs at the mill. This negative impact of suckering on productivity has yet to be considered by the industry. The presence of a mature parent stalk was also found to have an effect on sucker morphology. In the absence of a mature stalk, sucker morphology changed to being more similar to that of a normal stalk. This too provides evidence for the translocation of substances from the mature stalk to the sucker.

The availability of nitrogen and moisture was shown to increase suckering. A significant interaction effect was also found between these two factors. The availability of light beneath the crop canopy was also shown to have an effect on suckering in some experiments but for the most part the results were inconclusive. Further investigation is required in order to establish the role of light in suckering. The data generated from this study has many implications for crop agronomy and plant breeding. Farmers could potentially reduce suckering by careful management of nitrogen fertilisation. The work has also highlighted a need to understand the link between trash blanketing and suckering. The breakdown of a trash blanket may provide nitrogen to the plant at the time that suckers are being produced. In order to reduce suckering plant breeders may need to alter the weighting of some traits in the breeding program. Many of these traits relate to the ability of the crop to remain erect under wet and windy conditions. Managed environment selection trials may also need to be considered. The required environmental conditions for such a trial have been defined. These trials would provide data on the genetic differences in suckering propensity in years when these differences

would not normally be expressed. While much remains to be done, this work has laid the groundwork for starting to manage the problem of suckering in sugarcane.

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Sugarcane suckers growing in a crop in the Mulgrave district near Cairns, Australia. Photograph provided by Dr. Nils Berding.

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5/01/03

Barry Salter