



YCS update

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Research effort continues to learn more about Yellow Canopy Syndrome

By Dr Frikkie Botha, Executive Manager, Strategic Initiatives

This update is to provide the Australian sugarcane industry with information on the progress of the Yellow Canopy Syndrome (YCS) research program.

Through our research, we are continuing to learn more about how YCS affects sugarcane as we focus on the dual goals of determining the cause of YCS, and learning about management strategies that can assist growers.

Frustratingly, the cause of YCS remains a mystery.

However, in recent months we have confirmed that YCS affected cane has increased sucrose and starch accumulated in its leaves, which had long been a focus of our research investigation.

These leaves always have elevated levels of sucrose and starch but this is not confined to the yellow sections of the leaf. Sugars and starch also accumulate in the green parts of the leaf.

This means that we have been able to develop a diagnostic tool for YCS for research purposes. However, because of the expense of the diagnostic, and also the fact that there are no specific management techniques for YCS as yet, this means that the tool is not useful beyond research.

We are working on developing better management strategies for YCS, but until these are refined, we are not developing a cheaper, broad-scale diagnostic test.

As we head toward the peak time of year for YCS, we can make the following observations.

YCS is more likely to appear whenever the crop gets a boost (such as rainfall) after a period of stress.

At this point, we believe that a young crop of cane at around the end of December or early January is the most vulnerable, as young crops seem to be hit harder and don't recover as well.

However, we have also observed crops to grow out of YCS over a period of 8-10 weeks. So while YCS can appear quickly, it can phase out and the crop may recover over a period of time.

Our research results have also not shown a correlation between severity of symptoms (yellowness) and the impact on yield. Some very yellow crops have had reasonable yield; and some mildly yellow crops have had poor yields.

Unfortunately, you can't manage your way out of YCS. However, the best strategy is to follow best practices to reduce the stress on your crop and make it as healthy as possible.

In other research findings, we have learnt that water content is approximately 10 percent lower in YCS symptomatic leaves than in asymptomatic leaves. However, water loss is not to the point of leaf curling or wilting.

This is validated by analysis of the plant's metabolism, which clearly shows that YCS yellowing is distinctly different to yellowing caused by water stress.

We are building a sugarcane gene reference database to identify disruptions to plant metabolism caused by YCS.

A better understanding of disruptions to plant health at a cellular level will help us better manage the problem and hopefully point us towards the cause.

You can also read more about some of the recent observations on page four (the back) of this newsletter.





Above: Treatments being applied to a field trial in November.

YCS plant physiology trials

In September, two new Yellow Canopy Syndrome research trials were planted. These field trials are in the Herbert and Burdekin using Q200[®] and KQ228[®] cane respectively.

The trials build upon our previous work which showed a correlation between the age of cane and the severity of YCS symptoms, this time with a greater focus on physiological functioning of the cane, root system health, and the search for ultra-structural impairments such as blockages in vascular tissue.

The trials will explore this area by applying a range of plant growth regulators before and during the YCS summer season.

These hormones will alter the natural growth rate as well as growth characteristics of the cane, which will provide key insights into the nature of the trigger mechanism for YCS.

The trials will investigate why some cane is more severely affected than other cane, what factors lead to greatest yield loss, and they will increase our knowledge of how we might manage this condition in the commercial farming system.

We will be employing state-of-the-art scientific instrumentation and laboratory techniques to evaluate these trials and will be working with our colleagues at CSIRO and the University of Queensland throughout the year to interpret our results.

YCS Pathology Trials

*Andrew Geering and Shiromi Basnayake (UQ),
Davey Olsen and Priya Joyce (SRA)*

A new, joint University of Queensland-SRA project on YCS commenced in October this year, which aims to find disease-causing agents that could be responsible for YCS. The experimental approaches are different to those tried previously, with the strategy being to keep a broad mind but progressively narrow possibilities through observing disease progression under various treatments.

In new field trials that have been planted in the Burdekin and Ingham, several different chemical treatments are being applied that target different groups of pathogen. For example, two types of broad activity antibiotic, streptomycin and oxytetracycline, are being tested on the sugarcane plants.

These antibiotics kill plant-infecting bacteria, and if any suppression of YCS development is observed, then we can reasonably conclude that bacteria are causing the disease. Armed with this information, we can then design more specific experiments to identify the actual bacterium.

In addition to antibiotics, we are testing the effects of applying different types of fungicide. The field trials will be complemented by laboratory work in Brisbane to search for plant pathogenic viruses, bacteria and fungi. Fingers crossed; we can crack the puzzle and if a pathogen can be identified, then this will lead to new disease management strategies.



Above: Cane grower Lindsay Altmann in a crop of second ratoon Q232[®], impacted by YCS. The neighbouring and worse-affected block of Q242[®] has been sprayed out.

Battling severe YCS impact at Proserpine

Cane grower Lindsay Altmann has seen the severe impacts of Yellow Canopy Syndrome (YCS) first hand at his Proserpine property.

When harvesters first moved into a severe YCS block of Q242[®] at the start of the 2015 season, it was yielding just 39 tonnes of cane per hectare (TCH) with a CCS of 4. The cane was thin and ropey and Lindsay was able to tie it in knots.

Working with Peter Sutherland from Sugar Services Proserpine to test the cane, they saw that the CCS picked up across the following 12 weeks, but it remained a few units below the mill even at its best.

The impact of YCS was a very severe hit where Lindsay estimated he lost about 3000 tonne last year from an average yearly production of about 10,000 tonne.

This year the Q242[®] improved at 60 TCH, but Lindsay said it was still too poor of a result to persist with. He has now sprayed it out for fallow and legume planting before he will try a different variety.

Even in 2016, when the harvester went in, the operator had to change base-cutters as it was struggling to cut the cane as it was dragging and breaking, which Lindsay believes was because the cane had lost structure from YCS.

At this stage, SRA researchers have observed YCS in all cane varieties, but there have been differences in symptom expression.

Lindsay's neighbouring block of Q232[®] also had YCS in 2016 and 2015, but it yielded in the range of 85-90 TCH in 2016. While he was still disappointed with the result, he is persevering with that block simply as "we can't follow everything".

"I don't know what causes YCS, but I have seen for us that YCS is worse when it is stressed, whether that be too wet, too dry, too cold, or other things," he said

In 2016, the Proserpine region is hoping to harvest one of its largest crops, with the estimate increasing by about 25 percent from the start of the season to above two million tonnes.

Lindsay agrees that the ideal growing season for the 2016 crop has meant that the issues from YCS have not been as bad in the district this year, compared to 2015.

"We haven't had the stress events this year, neither with prolonged dry or wet. But, in saying that, 60 TCH is a real hit compared to everything else," he said.

"I'm very keen for answers and I know that SRA is trying hard at it. But it is one of those things that is hard to define, and even things like determining a starting point and a finishing point seem very difficult."

Observations

Following the completion of 2015 trials, researchers working on YCS have made a number of observations. These include new findings, as well as updates to previous observations based on new information.



1

Clean cane (from 10 years in quarantine), planted into the Burdekin became YCS affected. It made no difference whether this cane was planted into soil or a soil-less medium (see above photos). Other plant sources also became YCS affected in this trial. This suggests that YCS is endemic to the Burdekin and that soil is not a factor.

2

Young, rapidly growing cane became more severely YCS affected than older cane. It also suffered a large yield penalty. This suggests that late harvest crops may be particularly susceptible this season. There is evidence that age of plant (and growth rate) rather than severity of symptoms may be the biggest influencer of yield loss.

3

As yet, no variety has been found to be YCS resistant, however some varieties become more symptomatic than others. We are yet to determine if this has an impact on final yield or sugar.

4

Imidacloprid significantly reduced symptom expression in Q200[®] in the Herbert.

Imidacloprid out-performed soil fumigation, nematicides, and fungicides in this trial.

5

A miticidal treatment was ineffective at reducing the incidence or severity of YCS, despite frequent applications.

It appears unlikely that mites are the causal agent/vector.

6

In two separate trials, fungicidal treatments have shown no improvement in incidence or severity of YCS despite frequent re-application. It appears unlikely that YCS is caused by a fungal pathogen.

7

Silica:Magnesium ratio was found to be an inconsistent trend in YCS cane and is therefore not recommended as a diagnostic.

8

There is some evidence that plants can recover from YCS within the season, suggesting that YCS may be a temporary condition and that it could be responsive to management.

SRA acknowledges the funding contribution from the Queensland Department of Agriculture and Fisheries towards this research activity.