

YCS update

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YCS in Queensland in the 2015 season



YCS research continues from all angles

By Belinda Billing, YCS Development Officer

Yellow Canopy Syndrome (YCS) is widespread throughout the sugar industry however the severity of the syndrome is inconsistent from block to block, region to region, and year to year.

In 2015 the regions that are most severely hit by YCS are Proserpine, Mackay and the Herbert River. The Burdekin region has also suffered from widespread YCS, although there appears to be fewer severely affected blocks than in these other three regions.

YCS prevalence is low in the northern areas around Mossman, Gordonvale, the Tablelands and Tully. There have, however, been some isolated cases of very severe YCS in these areas and other cases of medium and low level YCS.

The Plane Creek area experienced YCS this season for the first time, although not at the same severity as Mackay or Proserpine. The southern region, including Childers, Isis and Bundaberg, has not reported any YCS.

Sugar Research Australia's research program into YCS has shown that the symptoms include a negative impact on photosynthesis, and also that sugar transport is affected.

It is thought that these symptoms result in reduced yield in the paddock and perhaps a tendency towards late accumulation of sugars.

The severity of the YCS symptoms in the crop will determine the level of impact on the crop. There are many blocks with low levels of YCS where it is difficult to determine the penalty imposed by the condition. In other cases the YCS is very severe and yield reductions may be estimated at 30 percent or higher. These severe cases are extremely concerning.

SRA's YCS program continues to search for answers with:

- A new CSIRO research program looking specifically at the role of the root system of sugarcane plant.
- A continuation of SRA's research project *Solving Yellow Canopy Syndrome*, led by Davey Olsen. This project is regularly refined based on learnings and will include a range of new trials going forward.
- A continuation of University of Western Sydney's program, *A novel polyphasic framework to resolve the YCS paradox*, which uses next generation sequencing to identify all organisms present in YCS-affected and healthy cane. Analysis is being conducted on leaf, stalk, roots and soil.
- A new project; *Leaf Sucrose: the link to diseases such as YCS and enhancement of sugarcane productivity*, to be led by SRA's Dr Frikkie Botha. This will build on the findings of Dr Botha's previous research project that identified a range of symptoms of YCS occurring inside the plant, such as an accumulation of sucrose in the leaf.



Burdekin grower **Cy Kovacich** is dealing with YCS for at least his second year running.

Grower observation: YCS impact less over the dry summer

Despite dealing with Yellow Canopy Syndrome (YCS) for at least his second consecutive year, Burdekin cane grower Cy Kovacich is hopeful he will have one of his better crops in 2015.

The dry, hot and sunny summer days in January and February that have been such a challenge for many cane growers in the industry have been an opportunity for Burdekin farmers with irrigation and heavy soils such as those where Mr Kovacich farms near Clare.

For Mr Kovacich, the conditions created ideal growing conditions and meant there was no water logging to hold back crop potential.

And he believes the same conditions may have played a part in YCS not appearing to be as bad at his property this year compared to 2014.

"Last year, in 2014, we had a hot summer and squalls of rain and the YCS definitely accelerated in those conditions," he said. "It was textbook examples of what we are hearing from SRA research that YCS can accelerate after rain events."

He said while it was obvious visually that the crop was unwell and that it developed a significant wilt, it was difficult to gauge the final impact on yield, and he believes the final impact was "not too bad". He said that he believed the symptoms presented more severely in Q247[®] and KQ228[®], but that it still presented symptoms across all varieties at his farm.

Mr Kovacich has simple advice that is supported by SRA research to date regarding YCS and the importance of minimising stress.

"Maintain a healthy crop," he said. "Don't cut back on anything. And when they find a cure for it, if it is curable, we will deal with it then."

Research trials reveal no yield or CCS increase for Imidacloprid use

Sugar Research Australia has recently gathered results from field-scale trials that looked at the relationship between cane grub insecticide products and YCS.

The Imidacloprid trials came in response to some observations from growers, particularly in the Herbert region, that use of chemical control (in particular liquid products) lessened the yellowing caused by YCS.

In response, SRA established four research trials, three in Ingham and one in the Burdekin, with some of the trials also looking at other important factors such as soil biology and water stress.

SRA researcher Davey Olsen said that while yellowing was delayed in all the trials, all the blocks eventually became yellow.

"In all trials, Imidacloprid treatments did not result in greater yield or CCS than the untreated plots," he said. "We suspect that Imidacloprid is hiding the visual yellowing symptoms of YCS, but the underlying YCS condition is still there."

"There is no evidence that Imidacloprid provides any long term benefit as a treatment for YCS."

"We certainly do not recommend using Imidacloprid products as a treatment for YCS. It does make the crop look a bit greener, but it is only temporary and eventually the YCS will develop in those blocks as well."

Imidacloprid is registered only for the use of cane grub control. Imidacloprid will be the subject of further trials in the year ahead.

See the latest CaneClip on YCS at www.sugarresearch.com.au

Search for YCS answers continues

The search for answers around the mysterious Yellow Canopy Syndrome (YCS) continues to pose challenging questions for researchers as the search for the “needle in the haystack” continues.

As part of the search for answers, SRA-funded research at Western Sydney University is using advanced scientific approaches to analyse YCS-affected cane and soils and non-affected cane and soils in the search for determining a possible cause of YCS.

By comparing the micro-organisms present in the healthy cane with the YCS cane, researchers will be able to determine if there are particular micro-organisms that are associated with the YCS cane and therefore may be causing the syndrome.

While it sounds like a simple process of elimination – it is far from a simple process.

First of all, researchers are confronted with astronomical numbers of micro-organisms living on the surface and inside the sugarcane plants.

These microbes are a key determinant of plant productivity and health. While pathogens can severely constrain productivity, the majority of the microbes can stimulate plant growth, help plants fend off disease, promote resistance to environmental stress and increase crop yield.

The research is revealing interactions between these complex communities and the sugarcane plant in unprecedented detail.

Sugarcane leaves, stalks and roots each have a specific community of microbes inhabiting them and these communities have a different composition depending on multiple factors such as the variety, crop cycle and chemicals applied on the field. Since YCS occurs in all sugarcane varieties, and regardless of the crop cycle or management, researchers are now looking for a signal of YCS among all these microbes.

Currently, from the nearly 50,000 different microbial species detected in the sugarcane and soil samples collected near Ingham, a shortlist of about 200 bacterial and fungal species that are more abundant in YCS-affected cane has been produced, and researchers are about to obtain information on viruses, phytoplasmas and other microbes in these samples as well.

However, even if a microorganism is identified as common in all YCS cane or soils, it might not necessarily be the cause of the syndrome.

YCS cane is sick. And just as when humans get sick, the sickness can open the door to other infections and problems, meaning that such a micro-organism might just be a symptom rather than a cause.

It is possible that such a micro-organism could be using the stress from the YCS as a gateway into attacking the cane. In addition, many microbes were found to be less abundant in YCS-affected cane, which can imply a loss of certain beneficial



Professor Brajesh Singh with the University of Western Sydney explaining progress on UWS research to **Professor Roger Hellens** with QUT. Prof Hellens is a member of the four-member Scientific Reference Panel, which provides guidance and oversight to SRA-funded research into YCS.

microbes, allowing for a pathogen to take over and potentially cause the syndrome.

Therefore, complex interactions between several microbes might be involved in YCS and researchers are filtering through all the microbial data, reducing the YCS signal-to-noise ratio, and separating microbes on the YCS shortlist into organisms that can potential cause of YCS versus organisms related to secondary effects.

There is also a significant challenge in making comparisons with non-YCS-affected varieties of sugarcane.

Even non-affected sugarcane will be impacted by a range of conditions or problems, including diseases and other stresses. In essence, just because cane is free from YCS does not mean that it is necessarily healthy.

Because YCS appears to fluctuate in intensity, there are questions about collecting the best possible samples of the syndrome at the best time.

Nonetheless, the research at Western Sydney University is adding significant knowledge to understanding this problem and is synchronising with other research projects that are underway at SRA and the CSIRO in order to determine cause of YCS and develop management strategies to minimise impact on the productivity.

The team at Western Sydney University collected samples in July from Ingham, Tully, Mackay and Ayr including both plant samples and the soil. This included both YCS-cane and non-affected cane.

The samples are currently being analysed and will add to work that has already been done from previous samples that were collected in Ingham in November 2014, which is continuing to add to the understanding of this complex problem.

Key recent findings

- * Sugar transport is affected with excessive carbohydrate accumulation in leaves causing yellowing.
- * Starch accumulation and other internal symptoms precede the yellowing.
- * Dye uptake studies show the translocation of dyes through the plants' vascular system is reduced in YCS leaves and stalks.
- * Fluorescence studies show impaired photosynthetic apparatus in both green and yellow leaves on YCS affected plants.
- * Confidor (Imidacloprid) temporarily alleviates symptoms only (no yield, CSS or biomass difference recorded).
- * Water stress triggers YCS symptom expression.
- * A range of pathogens have been observed in YCS cane (e.g. viruses, *Pachymetra*) but no single pathogen has consistently been found on YCS samples.

SRA researcher **Davey Olsen** investigating YCS.

SRA partners with productivity boards to find management options for YCS cane

SRA researcher Davey Olsen runs the project *Solving Yellow Canopy Syndrome*. His project has two components, one understanding and working to solve Yellow Canopy Syndrome (YCS) and another looking for management strategies to alleviate the impact on the sugarcane crop, or managing YCS.

Davey and his team have partnered with productivity services in Mackay (MAPS), the Herbert (HCPSSL), Proserpine (SSP) and the Burdekin (BPS) to investigate potential management strategies and find answers to some questions raised by growers in each region.

A series of replicated regional trials will be set up and supported by staff from both SRA and these productivity boards. Findings from the trials will be communicated around the region with field walks and onsite events.

The management practices being investigated range from soil health (including compost, mill mud, silica and biology preparations), to insecticides, nitrogen management, tissue culture and irrigation scheduling.

These treatments have been decided with input from productivity services staff, who have taken into consideration questions raised by growers, as well as input from SRA delegates.

Trials are currently being implemented on sites that have shown recent severe YCS.

