



Dr Anthony Young with the Centre for Crop Health, USQ, at the Indonesian Sugar Research Institute.

Tracing the origins of ratoon stunting disease (RSD) of sugarcane

Senior Research Fellow, Centre for Crop Health, University of Southern Queensland, Anthony Young, used an SRA Travel and Learning Award to visit the Indonesian Sugar Research Institute (ISRI), East Java, in August 2016.

Ratoon stunting disease (RSD) has caused untold yield losses to the sugar industries of Australia and the world for at least 70 years.

It is spread by harvesting and planting and, unlike most diseases, it has no clear symptoms, making it difficult to tell whether a crop is infected.

In fact, it was only discovered in 1945 when a field of Q28 growing in Mackay was inadvertently planted using diseased seed on one side and healthy seed on the other, and the marked differences in crop size raised suspicions.

When it was found that diseased Q28 could infect healthy Q28, and that other varieties were infected, it was clear that a previously unknown disease was present.

The alarm bells rang soon after diseased cane was found in quarantine: whatever it was, it was widespread, and had apparently been around for a considerable period of time. But where did it come from?

Dr Anthony Young from the Centre for Crop Health, University of Southern Queensland, has been on the case of RSD for many years, from his cane-farming upbringing, his PhD studies, and work as an Extension Officer in the NSW sugar industry. In August, he travelled to the Indonesian Sugar Research Institute (ISRI), East Java, to see if he could trace the origins of the disease.

"It's clear that RSD could not have come from the home of sugarcane, New Guinea, as it has only recently been introduced there," he said. "But the bacterium that causes the disease is

highly adapted to living in the veins of sugarcane, so it's likely it was originally present in one of the wild relatives of cane."

Which brings him to Java.

"Faced with diseases that were wiping out production, the Dutch breeders, at the ISRI site I visited, crossed commercial canes with wild canes to generate hybrids that were resistant to the major diseases. These hybrids were distributed throughout the world's sugar industries where they were grown commercially and used for breeding."

"There's probably no commercial variety growing today that can't trace its ancestry to a series of crosses made in Java in 1921. This presents the perfect pathway for a new disease to enter into the world's industries."

The key to identifying the origin of RSD lay in detecting bacterial strains from which the strain that causes RSD could have come from. So using the LSB-PCR technique, Dr Young and the ISRI team tested a range of wild canes and commercial seedbeds to find out if related strains were present. The results surprised them.

“We found evidence for the presence of different strains, but most of them are very closely related to new strains we’ve found in Australia. We don’t know where they come from, whether they cause a disease, or how they interact with the plant. We also found upwards of 50 percent RSD infection in the seedbeds, so there’s scope to make marked yield improvements if we sort out RSD.”

The Java trip was also an excellent opportunity for Anthony to see how cane is grown in one of our nearest neighbours and to interact with strategic partners.

“My Indonesian colleagues could not have been more welcoming. It’s a very different way to grow cane and it gives one a new appreciation for the challenges facing worldwide agriculture.”

Dr Young hopes that by tracing the origins of RSD, we will get a better understanding of how the disease works, and potentially identify sources of resistance that can be used to improve RSD control in Australia.

“We know from experience that we get massive yield increases if we control RSD by uptake of clean seed. Unfortunately, as the disease can be harvester transmitted, fields tend to pick up the disease, which limits the number and quality of ratoon crops that can be achieved. If we knock RSD on the head by using resistant varieties, we’ll enjoy industry-wide productivity gains, allowing our industry to then focus on solving the other issues we face.”

And the next steps? Dr Young hopes to further his work characterising the new strains, and hasn’t given up on his quest to solve the RSD riddle.

“SRA have supported my work on this disease and, with the support of the stakeholders throughout the industry and collaboration with partners at Southern Cross University, we’ve made excellent progress. Hopefully we’ll see some massive yield gains in future years.”

Below (inset): In the field sampling for RSD in Indonesia.

Below: Using clean-seed cane has been useful in controlling RSD. Disease-free seed is produced for distribution to farmers by repeatedly hotwater treating (50°C for 3 hours).

