

Pot trials comparing the establishment of weed seeds versus sugarcane seeds, which shows the dominance of the weeds.

## Project details

### Key Focus Area: 1

Optimally adapted varieties, plant breeding and release

### Project name

Seed dormancy and establishment: a critical gap in knowledge to support safe deployment of GM

### Project number

2011/022

### Principal provider

CSIRO

### Project end date

Project complete

# Sugarcane seed project looks at cane's 'weediness'

*Most farmers spend little time thinking about whether the tiny seeds from sugarcane flowers actually germinate in their paddocks or the broader environment. By Brad Pfeffer*

For most of the industry's history, the issue is one that has not been significant to the farming system or worthy of much consideration and study.

But when it comes to the future research around new genetically modified (GM) sugarcane varieties, understanding this seed and its germination is crucially important for the industry and for regulators.

With this in mind, a project that has just been completed by CSIRO has looked at the issue of sugarcane seed production and the behaviour of seed in the environment.

This important research has completed the groundwork to ensure that the industry understands the behaviours of the sugarcane plant and that the industry can ensure that there is a smooth evidence-based path that could lead to the adoption of future GM traits.

Dr Graham Bonnett with CSIRO led the project and he said that it was

important that any future GM traits did not increase the weediness of sugarcane, and introduce problems to the farming system and environment.

"Sugarcane doesn't establish well outside of farmers' fields, but some of the wild relatives of sugarcane are declared weeds, so we don't want to turn our back on that risk," he said.

This SRA-funded research is ensuring that the industry is on the front foot and has the information available that can help to guide any new GM varieties through to commercialisation more quickly for the industry.

Any GM varieties will need to go through a strict regulatory process that is run by the Office of the Gene Technology Regulator (OGTR), which will include proving that the new varieties aren't increasing the risk of becoming weeds. The industry needs to be able to demonstrate that such GM traits do not pose a risk – and hence the need for this research.

The CSIRO research to date has suggested findings that may not surprise farmers – and that is that sugarcane seeds are 'weaklings' in the environment, especially when compared to the weeds they compete against.

In short, the sugarcane seeds are short lived in the soil seed bank and competition from weeds limits their establishment.

"The production of viable sugarcane seeds from Ingham to Mossman occurs at a time of the year that is rarely conducive to germination," Dr Bonnett said. "Seeds are produced in winter when rainfall is low and temperatures are colder than the seeds want for good germination."

So while this meant that seeds were unlikely to germinate during flowering times of the year, it also meant that the researchers needed to assess and understand how long the seeds might stay dormant in the soil.

Dr Bonnett said their experiments indicated that no seeds lived longer than six months when buried at 5-10 cm and nine months when buried at 30 cm. All this means that the research has found that sugarcane seed neither exhibits dormancy nor longevity, which all pointed toward low 'weediness'. However, Dr Bonnett said that further research may be needed in the future, particularly if GM traits go down new pathways.

The first generation of GM sugarcane currently being developed is for herbicide tolerant traits. However, future generations of GM cane may look at a range of other stress tolerance traits that could include, for example, water use efficiency or water stress resistance.

If such GM traits are progressed they would be designed to improve sugarcane's performance under currently sub-optimal conditions. The research has developed ways to measure any changes in the performance of sugarcane seed's ability to survive under these conditions when compared to non-GM varieties.



Simply, researchers understand that current sugarcane seeds are generally not weedy, but the industry will also need to understand if any seeds from new GM traits are at risk of becoming more weedy. In such a case, this may need to be tested.

**Above image**

Dr Graham Bonnett with CSIRO checks over pot trials in the greenhouse at the CSIRO facility at the University of Queensland's St Lucia campus.

## New MOU to strengthen sugarcane breeding in both Australia and Vietnam

Sugar Research Australia (SRA) and the Sugarcane Research Institute (SRI) of Vietnam have signed an historic Memorandum of Understanding (MOU) that will pave the way for exchange of genetic material between the two countries' plant breeding programs.

The 10-year MOU is aimed to allow both countries to improve their sugarcane plant breeding and deliver improved outcomes for growers and millers.

This will be done by SRA and the SRI Vietnam working collaboratively to exchange sugarcane germplasm between their respective breeding programs, as well as working cooperatively on research on sugarcane diseases and pests of mutual interest, and other collaborative research ventures such as trait development, molecular biology and crop management.

SRA Chairman Mr Paul Wright AM said that expanding the genetic base within the SRA sugarcane breeding program was vital for SRA to be able to continue to develop new and improved sugarcane varieties for growers and millers.

"SRA already has variety exchange agreements in place with more than 15 countries around the world and this new MOU with Vietnam is expected to deliver new opportunities for growers and millers, by allowing us access to a greater pool of genetic diversity," Mr Wright said. "Bringing in overseas genetics to our breeding program allows us to improve the parent population in the program."

Director General of the SRI Vietnam, Dr Nguyen Duc Quang, said that the MOU would benefit both countries' industries, as breeding material often came from different sources.

Vietnam also has some important diseases and pests which are of biosecurity concern to Australia.

"Working together, we can help lessen their impact on the Vietnamese industry, as well as ensuring that the Australian industry is well prepared for any incursion," Dr Nguyen Duc Quang said.