Using introgression to put new genes into sugarcane varieties

Research is underway looking at the wild relatives of sugarcane to bring in the good traits from these species and see them drive productivity and profitability outcomes for sugarcane growers and millers.

It's that time of year when State of Origin is in full swing, and everyone in Queensland gets patriotic about our dominance over the last decade.

That success has since 2006 has come about because of a team with a winning combination of players.

But, aside from a few key players, the blokes who ran onto Suncorp Stadium in 2006 are a different combination to that running out this year.

To keep winning, Mal Meninga and Kevin Walters have brought in new blood when needed, which is what great footy teams do.

Breeders are always trying to put together the best combination of genes in new varieties for all crops. They must bring in "fresh blood" (new genes) to develop new, improved varieties. In plant breeding, genetically diverse (e.g. foreign clones) and wild species are the source of new genes.

But research is underway to continue to push the envelope of what can be achieved with new sugarcane varieties, by looking at the wild relatives of the sugarcane plant to bring the traits of these plants back to commercial varieties.

This process is called introgression and it is looking at wild relatives that have some traits that would be very valuable for sugarcane growers and millers.

For example, some of these wild relatives have high resistance to nematodes, near immunity to Pachymetra, and they can grow in harsh conditions. However, they have very low sugar and fertile hybrids are rare in some species.

Along with a range of other projects that are continuing to improve sugarcane plant breeding, the research is planning to use these wild relatives of sugarcane to help lift the salary cap for sugarcane varieties and help the industry field better teams.

One of these projects is aiming to identify the chromosomes within one wild species (called *Erianthus arundinaceus*) that has traits that would be desirable in sugarcane varieties.

Project details

Key Focus Area

Optimally adapted varieties, plant breeding and release

Project name

Developing cytogenic and molecular tools to improve selection for soil-borne pathogen resistance in wild hybrids

Project number

2013/358

Project end date

Concluded

If these chromosomes can be identified in the lab, then it will be easier to identify those traits in potential new varieties. This has been the subject of a research project led by Dr Nathalie Piperidis with SRA in Mackay.

"This will be a tool for the breeders to assist in creating new varieties. The tool could be used to identify regions of the chromosomes from *Erianthus* hybrids, and in the longer term we will be able to associate those chromosomes to disease resistance or other traits in new varieties," she said.

In other words, the aim is to work out the best "position" or combinations of these chromosomes in the team. This information is useful and important because of the complexity of the sugarcane genome, and the fact that the genome has not been sequenced as it has for many other field crops.

Nathalie is now leading a new project (2016/039) that is also working on bringing in the resistance – or near immunity – to Pachymetra from *Erianthus* into future sugarcane varieties developed by SRA.

It is already understood that wild relatives including some types of *Erianthus* in Indonesia are immune to Pachymetra.

"This work was initiated about 20 years ago to introduce these traits, but it did not work at the time because the first generation hybrids that were created from these Indonesian *Erianthus* were sterile," she explained. "Today, though, we have a new strategy."

"For the last 10 years we have been studying *Erianthus* hybrids that were made in China, so now we are looking at crossing the immune *Erianthus* from Indonesia with the fertile *Erianthus*. If we can capture that immunity to Pachymetra and transfer it to our sugarcane varieties, that's the target we are chasing."

We are not yet at a point where SRA can create a new variety that would be as good as fielding 13 players of Jonathon Thurston's calibre, but this new research, along with a number of other approaches to modernise the breeding program, is continuing to find ways to improve new sugarcane varieties.

SRA thanks the Queensland Government (DAF) for the funding contribution towards this research activity (project 2013/358).

For more information on varieties, the Varieties and Plant Breeding Update is provided free to SRA members with each edition of ***Cane****Connection*, and regional Variety Guides are provided in spring each year.

For more information

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