

2014 Variety wrap-up



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At this time of year SRA's Plant Breeding team is in the final stages of harvesting, measuring and recording all variety trials. The focus will shortly turn to the analysis of trial results in preparation for next year's Variety Adoption meetings – where potential new experimental clones are recommended for release, maximum propagation or to be accelerated for possible future commercial release.

A successful crossing season

Field and photoperiod crossing activities conducted in 2014 resulted in 1870 crosses. The crosses provide seed for a new cycle of selection to produce future new varieties in about 10 years' time.

Planting and harvesting of variety trials – first-selection stage Progeny Assessment Trials (PATs), second-selection stage Clonal Assessment Trials (CATs) and Final Assessment Trials (FATs) – at all locations have been completed. This year 32 variety trials were planted and 106 variety trial sites – approximately 17 714 experimental clones and 168 040 experimental seedlings – were harvested.

Outcomes of the 2014 Variety Adoption meetings

The Herbert committee was the only region to approve and recommend varieties. The committee approved two new varieties (Q226[®] and Q250[®]) and recommended two blanket-approved varieties (Q252[®] [limited release] and Q253[®]).

A total of 19 new experimental clones were collected by productivity boards for propagation and will be further analysed at the Variety Adoption meetings in early 2015.

Experimental Clones and QCanes received by regions

Northern region

Eight Accelerated experimental clones went to northern productivity boards. Successful experimental clones in this series will be considered for possible release in 2016.

Southern region

Two Maximum Propagation experimental clones went to southern productivity boards. Successful experimental clones in this series will be considered for possible release in 2015.

NSW Condong Mill region

Four Maximum Propagation experimental clones and one Accelerated QCane went to Condong productivity boards. Successful experimental clones in this series will be considered for possible release in 2016.

NSW, Harwood & Broadwater Mill regions

Five Maximum Propagation experimental clones and one Accelerated QCane went to the Harwood and Broadwater productivity boards. Successful experimental clones in this series will be considered for possible release in 2016.



Above: Q253[®] grown in the Herbert.



Above: Q250[®] grown in the Herbert.



Research and development

SRA funds 19 research projects that contribute to the plant breeding program; many are done in collaboration with our research partners.

1. Germplasm diversity

Sugarcane has a narrow genetic base, with most modern varieties originating from a restricted number of parents of the *Saccharum officinarum* and *S. spontaneum*. Some wild species, particularly *S. spontaneum* and *Erianthus arundinaceus*, have some valuable traits like disease and nematode resistance and stress tolerance, that would be valuable to transfer into the cultivated hybrids. This process, called introgression, requires considerable research and a long-term breeding commitment to be successful.

1. *Accessing stress-resistant sugarcane and research investment from China*
2. *New germplasm to develop more productive varieties*
3. *Exploiting introgression for the development of productive and regionally adapted varieties for NSW*
4. *Advancing yield, disease resistance and ratooning by exploiting new sources of genetic variability from wild relatives of sugarcane*

2. Trait selection

Yield improvement, a key breeding objective, is a high industry priority. However, selection for cane yield in early-stage selection trials is notoriously difficult, because of large inter-plot competition effects and environmental variation, and there are no easy solutions. Improving yield prediction accuracy in early-stage trials will greatly improve gains in breeding programs.

1. *More crop per drop: developing water-efficient and drought-tolerant sugarcane cultivars for irrigated and dryland farming (Completed 2014)*
2. *SaveN Cane: Developing selection tools for N-efficient sugarcane (Completed 2014)*
3. *Preparing the Australian sugar industry for threats from exotic pests and diseases (Completion 2015)*
4. *Investigation of smut-resistance mechanisms in sugarcane (Completion 2015)*
5. *Selecting for favourable plant x soil water interactions*
6. *SmutBuster II – accelerated breeding of smut-resistant varieties*

3. Pre-breeding tools

Sugarcane has a complex genome and little is understood about the genes that control its physical traits. Many of the research projects in this area stand to get a better understanding of its genome and the ability to target genes that may lead to a targeted approach to plant breeding.

1. *Towards a complete genome sequence of sugarcane; generation of data and development of bioinformatic resources (Completion 2015)*
2. *Seed dormancy and establishment: a critical gap in the knowledge to support safe deployment of genetically modified sugarcane (Completed 2014)*
3. *Faster flowering – new opportunities for genetic improvement (Completion 2015)*
4. *Development and testing of an SNP marker platform in sugarcane and Applying the genome sequence for variety improvement: validation and implementation (Completion 2015)*

4. Selection efficiency

In order to continue to increase the rate of genetic gain through new, more productive varieties, research to improve different components of the sugarcane breeding and selection programs are needed. Many outcomes of this research have already been implemented, making the SRA Australian sugarcane breeding program one of the best and most scientifically-based programs in the world. On-going research to improve parent selection using conventional and molecular marker methods as well as the effectiveness and efficiency of selection will result in further improvements in genetic gain and, ultimately, healthier, more productive varieties.

1. *Improving the accuracy of selection in sugarcane breeding trials through accounting for site variability*
2. *Maximising the rate of parental improvement in the Australian sugarcane breeding program*
3. *Maximising genetic gain from family and within-family selection*
4. *Developing cytogenetic and molecular tools to improve selection for soil-borne pathogen resistance in wild hybrids*

5. Post-release (adoption)

A large amount of information is collected by mills on the productivity of different varieties. However, these important and valuable data are not easily available and are not analysed in a routine way to provide good information on the relative performance of varieties in different situations. A project to collect, store and analyse mill data along with other agronomic information will provide better recommendations to growers and thus assist in increasing productivity.

1. *Optimising productivity and variety recommendations through analysis of mill data*

