Sugar Research Australia

Information Sheet

IS13032

Crossing

History

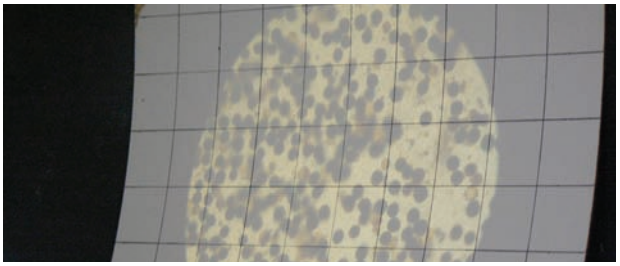
Each year, from mid-May until the end of June, plant breeding activities at SRA Meringa focus on the first step in the plant improvement process, known as cross pollination, or simply, crossing. Crossing involves bringing two complementary parents together to produce sexual seed from which, hopefully, a new variety will develop with favourable characteristics resulting in it being selected for the industry.

Crossing census

Before crosses can be made, a census is conducted to determine which parent canes have flowers available. The number of flowers for each parent is counted, and a small sample of a flower from each variety is removed for laboratory testing to determine the sex of the parent (for example, whether there is pollen being produced or not). The census results in a list of female (female fertile, male infertile) and male (female fertile, male fertile) varieties for each of which the number of available flowers is known.

Pollen test

A sample of male organs, also called anthers, is taken from each flower sample and tested for pollen viability using a simple starch-iodine test. Test results may range from zero pollen present (a good female) to abundant pollen with a high percentage of starch-filled grains (a good male).



Choosing parents

Following the pollen test, parents are chosen on their merit, based on economically important traits including cane yield, sucrose content, disease resistance and other factors. These data are accumulated from trials over many years. The SRA breeding program maintains a large collection of about 2000 parents to ensure a wide range of genetic variability is available and to guard against genetic vulnerability in the commercial crop.

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Collecting flowers

Once decisions have been made on the best available combinations between parents, the crossing team collects the desired flowers from the field. Care is taken to ensure the flowers used as females in crosses are collected in a virgin, or unpollinated state. This ensures that seed is produced as true-to-label as possible, and is not the result of field pollination.

Controlled crossing

The parentage of seed from crosses made at SRA Meringa is controlled by making the crosses in a pollen-proof bag or crossing lantern. This is made of premium quality cotton or polyester cloth. Female flowers placed in this will be pollinated by the accompanying male flowers with minimum contamination from wind-borne pollen.

Seed preparation

Female flowers in a cross are mature when the flowers begin to break up. Then they are collected in a nylon bag and dried to a low moisture content in a special cold dehumidication seed drying facility.

Packing seed

Once dried, the flowers or fuzz containing the seed are separated from the flower branches and packing in special multi-laminate plastic and aluminium foil packets that, when sealed, do not allow moisture updake by the seeds. These packets are stored in a larger freezer at -20°C. Packets of seeds of selected crosses are sent to four SRA breeding programs. Once at these destinations, the seeds are germinated to establish original seedling populations which form the basis of SRA plant improvement activities.

Photoperiod facilities

On average, variable and only moderate flowering occurs at SRA Meringa due to quite significant fluctuations in weather conditions. Varieties which have difficulty flowering under such conditions are termed shy flowering. The three photoperiod facilities help to overcome this. They allow us to make specific cross combinations that cannot be made during field crossing, by controlling the day length through computers. This induces flowering at different times. Night temperature in the facility is controlled at 22°C to 24°C to maximise pollen fertility.

Ongoing research

Progress made in the SRA Plant Improvement Program would not be possible without the support of an active research program. Crossing is but one part of Plant Improvement Activities. The wide range of research and core activities undertaken by plant improvement scientists and research assistants helps ensure the industry has a productive, profitable and sustainable future.