



PLANT
SYNBIO
AUSTRALIA

TRANSFORMING
AGRICULTURE AND
BIOMANUFACTURING
THROUGH PLANT
SYNTHETIC BIOLOGY

Plant transformation at Plant SynBio Australia



plantsynbio.au

The team at Plant SynBio Australia have developed extensive hands-on expertise in manipulating plant genetics to engineer improved genetic traits, with a particular focus on important agricultural crop species.

Agrobacterium tumefaciens is a soil bacterium that causes plant crown gall disease through natural horizontal gene transfer to plant cells. However, when disarmed, *A. tumefaciens* strains designed for plant transformation can deliver useful genes to plant cells and permanently modify the plant genome. Coupled with efficient plant regeneration systems this unique feature provides plant scientists with a powerful tool to genetically modify plants for both fundamental research purposes and agricultural crop improvement.

Agrobacterium-mediated transformation (AMT) is the method of choice for most plant species due to its efficiency and tendency to generate either single or low transgene insertion events with minimal molecular rearrangement.

Plant SynBio Australia is funded through Bioplatforms Australia under the National Collaborative Research Infrastructure Strategy (NCRIS) and institutional partners

Plant transformation

End-to-end transformation capability

Standard AMT workflows have been established at Plant SynBio for cereal crops, such as barley (*Hordeum vulgare*), legumes such as cowpea and horticultural species such as tomato.

Model genotypes are routinely used due to their relatively high amenability to genetic transformation and *in vitro* regeneration. However, our transformation services are not limited to model cultivars and can be adapted for a range of commercial genotypes upon request.

Our staff can perform each step of the entire transformation process from the preparation of donor material to the propagation of transgenic plants for seed production.

We also are equipped to perform particle bombardment using the Biorad Biolistics PDS-1000 system for species not amenable to AMT.

Transformation and validation

The transformation process encompasses careful and precise excision of suitable explants (totipotent plant tissue) which are amenable to both *Agrobacterium*-mediated delivery of expression cassettes or CRISPR/Cas genome editing constructs and efficient *in vitro* plant regeneration to obtain stable, genetically modified and edited plants.

Downstream molecular analyses include nucleic acid extraction, PCR-based screening, and sequence verification to confirm the presence and integrity of the introduced

transgenes or editing components, as well as to identify targeted genome modifications.

Together, these workflows enable the generation and validation of genetically modified plant lines for functional genomics and trait development studies.

Research connections

Plant SynBio is part of Bioplatforms Australia, a national infrastructure network providing research facilities and expertise to support life science research tackling national challenges in health, agriculture, food, and biodiversity. This allows us to support an integrated approach to research projects spanning genomics, proteomics, metabolomics and bioinformatics projects.

As part of Australia's National Collaborative Research Infrastructure Strategy (NCRIS) we are connected with over \$4 billion worth of state-of-the-art infrastructure, data and expertise to help address complex research challenges. These connections include the Australian Plant Phenomics Network (APPN), the South Australian Genomics Centre (SAGC), the Australian Genome Research Facility (AGRF), Metabolomics Australia and Microscopy Australia.

Availability

Plant transformation services are available through Plant SynBio Nodes at Adelaide University, ANU Canberra, La Trobe University Melbourne, and the University of Western Australia Perth.

Capabilities:

- **Expertise in both transient and stable plant transformation** across a wide range of crops and horticultural species (e.g. wheat, barley, canola, cowpea and tomato).
- **Highly efficient transformation systems** tailored to multiple cultivars, including elite commercial varieties.
- **Fully equipped molecular biology laboratory:**
 - RNA/DNA handling and analysis equipment
 - qPCR capabilities
 - Analytical microscopes
 - Secure sample storage facilities
 - Plant tissue culture facility
 - Vacuum and biolistic transformation equipment

plantsynbio.au

Email us:

La Trobe University:
plantsynbio@latrobe.edu.au

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