



## germplasm enhancement team

The Germplasm Enhancement Team uses and develops cell and molecular technologies.

These technologies provide benefits for clients and partners in New Zealand and worldwide.

## Research areas

### Development of new genetic technologies

**Intragenics** – modifying plants using vectors and DNA sequences derived from a plant's own genetic material. The resulting plants are not 'transgenic', although they are created using the tools of molecular biology and plant transformation.

**Apomixis** – clonal seed production, is being studied in a model plant system with the ultimate aim of transferring the trait to crop plants. This would enable hybrid lines with fixed heterosis (hybrid vigour) to be grown through successive generations without any need for controlled pollination. Apomixis would, therefore, significantly increase the pace of plant breeding, leading to the rapid development of new hybrid varieties at a fraction of the current cost.

**Protoplast fusion** – there is increasing interest in using protoplast fusion as a

method to generate new germplasm. This technology is currently being used in projects involving brassicas and forages.

### Application of genetic technologies

Genetic technologies are being applied in a number of ways.

#### TO STUDY FUNDAMENTAL PLANT PROCESSES INCLUDING:

- Manipulating the carbohydrate content of onions, potatoes and peas
- Modifying the way biologically active sulfur compounds are metabolised in Allium and Brassica species
- Manipulating pigmentation biosynthetic pathways to improve the impact of plants on the nutrition and health of consumers

## team capabilities

The Germplasm Enhancement Team uses a range of molecular and advanced genetic technologies to produce enhanced germplasm suitable for developing new crop cultivars.

In addition to this applied work, we are continually developing a better understanding of plant genetics in fundamental research programmes. The team has expertise in tissue culture, cytology, transformation, genetics, gene mapping, GM detection and biochemical and molecular analyses.

Scientists in the Germplasm Enhancement team work closely with plant breeders in the Crop Improvement Team as well as with researchers in the Centre for Advanced Bio-Protection Technologies at Lincoln University.



## CROP & FOOD RESEARCH

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- Manipulating protein composition in pea seed
- Manipulating plant architecture in peas

### TO DEVELOP GENETIC MAPS TO ASSIST CONVENTIONAL PLANT BREEDING

#### Vegetable crops

- Potato genome sequencing consortium – membership of international consortium to fully sequence the genome of potatoes
- Markers for potato powdery scab resistance
- Onion genetic linkage map – markers for N, C and S metabolism
- Tagging onion maintainer (MS) locus
- SSR fingerprinting of vegetable germplasm

#### Arable crops

- Genetics of Ascochyta blight resistance in pea – develop molecular markers linked to resistance QTLs
- Identifying novel ingredients in peas to modulate their glycaemic impact
- Developing cereals with reduced crease characteristics as new delivery mechanism for raw materials with altered glycaemic impact
- Designing and generating molecular tools to develop novel and unconventional germplasm for wheat grain attributes.

### TO DEVELOP ENHANCED GERmplasm

- Developing strategies to minimise pesticide use and to improve the adoption of plant resistance to pests and diseases

– peas, onions, leeks, garlic, potatoes, brassicas

- Developing herbicide resistant onions
- Undertaking gene introgression in barley

### TO DEVELOP PLANTS AS FACTORIES FOR HIGH VALUE PEPTIDES

- Genetically modified crops as ‘solar powered’ bioreactors to produce high value materials (hairy roots and whole plants)
- Animal vaccines
- Food enzymes

### TO DEVELOP DIAGNOSTIC PROTOCOLS – FOR GM CONTENT, DISEASES, BIOSECURITY

#### Environmental impacts of genetic technologies

We co-ordinate a multi party programme studying:

- invasiveness of genetically modified crops
- gene flow from genetically modified crops
- impacts on non-target invertebrates and microbes
- measurement and persistence of DNA in the environment and food

### RESEARCH TEAM

The Germplasm Enhancement Team has 27 staff based at Lincoln.

## contacts

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