

Molecular Diagnostic Centre

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The Molecular Diagnostic Centre at the South Australian Research and Development Institute (SARDI) delivers technologies that provide strategic support for the grains and other primary industry sectors across Australia.

The national centre delivers molecular diagnostic technologies, and the associated interpretation, for growers, export industries and researchers.

Since 1997, our services have expanded from the Australian grains industry to include testing for the fodder, horticulture, grape and wine, aquaculture and fishing industries.

Core Technologies

The SARDI Molecular Diagnostic Centre (MDC) laboratory is located at the Plant Research Centre at Waite Campus, Adelaide in South Australia.

The core technologies include DNA extraction from environmental samples using proprietary methodology and a broad range of quantitative DNA tests (qPCR) for plant pathogens, beneficial organisms and plant roots in soil and grain.

The MDC has the capacity to extract DNA from up to 500 g of environmental samples such as soil, sediments and plantroot systems. Robust DNA extraction protocol ensures accurate DNA quantification by qPCR.

The laboratory is accredited to receive international samples, with appropriate permits, and can process up to 250 samples a day.

Services

The Molecular Diagnostic Centre's service activities include:

- PreDicta B (grains) and PreDicta Pt (potatoes)
- Bacterial Wilt and Golden Dodder Testing
- ARGV Testing Service for Export Hay
- Root Disease Testing Service
- Nematode Screening Services (CCN / FLN)

These services are provided under commercial terms and underpin:

- Informed decision-making by growers and consultants on management of soil-borne pathogens
- Research on epidemiology and management of soil-borne pathogens
- Research to monitor beneficial organisms
- Phenotyping pre-breeding and breeding support
- Training of consultants and farming systems groups in root disease management

Identifying the main disease risks before sowing means growers can implement management practices such as fungicide seed dressings, crop rotations and modifying sowing techniques and timing to lower their risk of crop yield loss.

Delivery to Industry

PreDicta B (B = broadacre) and PreDicta Pt (Pt = potato) are DNA-based soil testing services to identify which soil-borne pathogens pose a significant risk to crops prior to seeding. Growers can access PreDicta services from agronomists accredited by SARDI to interpret the results and provide advice on management options to reduce the risk of yield loss.

PreDicta B has been developed for cropping regions in southern Australia and includes tests for:

- Cereal cyst nematode (CCN)
- Take-all (*Gaeumannomyces graminis* var *tritici* (*Ggt*) and *G. graminis* var *avenae* (*Gga*))
- Rhizoctonia barepatch (*Rhizoctonia solani* AG8)
- Crown rot (*Fusarium pseudograminearum* and *F. culmorum*)
- Root lesion nematodes (*Pratylenchus neglectus* and *P. thornei*)
- Stem nematode (*Ditylenchus dipsaci*)
- Blackspot of peas (*Didymella pinodes*, *Phoma medicaginis* var *pinodella* and *Phoma koolunga*)



Accurate and timely identification of soil-borne pathogens gives Australian grain growers the opportunity to reduce crop yield losses estimated at more than \$300 million a year.

PreDicta Pt is a DNA-based soil testing service to identify if certain soil-borne pathogens pose a significant risk to potato crops prior to planting.

Currently PreDicta Pt provides an indication of the risk of:

- Powdery scab (*Spongospora subterranea*)
- Black dot (*Colletotrichum coccodes*)
- Root knot nematode (*Meloidogyne fallax*)

DNA levels of *Streptomyces txtA* gene, *Rhizoctonia solani* AG3, *R. solani* AG2.1, *Meloidogyne* hapla and *Verticillium dahliae* are reported for information only as sensitivity and risk categories are not available for these tests.

Delivery to Researchers

Molecular Diagnostic Centre services provided to research programs nationally include:

- Soil-borne pathogen assessments in field trials across the country
- High capacity analyses, which enables large studies to be conducted
- Ability to run multiple assays per sample to study interactions between soil-borne pathogens, beneficial organisms and plant root growth to better understand plant performance in field trials
- Identifying resistant breeding lines by assessing levels of pathogens difficult to score visually. e.g. assessing fungal levels in stubble and *Pratylenchus* nematode numbers in root systems.

Uptake by researchers has steadily increased over the past 10 years, from around 5,000 samples in 2002-03 to more than 31,000 in 2013-14.

The MDC also provides a focus for the promotion and commercialisation of research outcomes by encouraging the development of new diagnostic tools and techniques, consultancy and training on all aspects of plant health.

New Applications

SARDI researchers are developing tests for free-living nematodes to monitor soil health, as well as tests for stubble-borne pathogens, including those associated with yellow leaf spot, eyespot and white grain with support from Grains Research and Development Corporation (GRDC).

The Molecular Diagnostic Centre has developed rapid, reliable tests to monitor the impact of finfish (tuna and kingfish) aquaculture on the marine environment. It is the first example in the world of DNA assays being used to assess environmental impact to support licensing regulations in aquatic systems. The same principles are now being used to develop rapid testing of priority marine pests.

In partnership with the Phylloxera and Grape Industry Board of SA, technology is being developed for the early detection and surveillance of exotic pest phylloxera in vineyards.

A test has been developed to monitor soil seed banks for declared weed branched broomrape.

Science Leader

Dr Alan McKay, who coordinates the national Molecular Diagnostic Centre, leads the Soil Biology and Diagnostics Science Program at SARDI. He has worked at the forefront of using DNA assays to quantify soil-borne organism for more than 30 years

Research partners

The national Molecular Diagnostic Centre works with the CSIRO, GRDC, South Australian Grain Industry Trust (SAGIT), Horticulture Innovation Australia Ltd and Meat and Livestock Australia (MLA).



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