DNA test a technological leap for the sugar industry

The importance of testing for soil pathogens is already well understood and established, and current research is looking at the application of new technology for our industry to deliver improvements and efficiencies.

What's hiding in your soil? Whether it is something good or something bad, there is no way to spot these microscopic organisms with the naked eye.

If it is pathogens down there causing damage to your cane, there's also every chance that you won't get a clear picture just from looking at yields and productivity. For Pachymetra, root-knot nematode, and root-lesion nematode, the impact is variable and may only be a few percent.

You might attribute the dip in yield to wet weather at harvest or a mistimed herbicide application – but it also could be one of these microscopic organisms eating the top off your yield.

And when the sugar price is only around $400, every tonne counts.

The only clear way to get a handle on these pathogens is via a soil sample and assay of your blocks. Typically, these samples are collected with the help of local productivity services organisations and then scientists at SRA's laboratory at Tully analyse the results.

Conducting these tests to understand your soil is vital to knowing where you stand and then adopting management practices to minimise any problems.

SRA Leader for Disease Management, Dr Rob Magarey, said that the results of these assays have the potential to surprise farmers, as evidenced by past work on Pachymetra.

"We've had farmers remark that a 'crop has been growing poorly for a while and I never knew why, until now'," he said.

"This highlights that unless farmers specifically look for the disease they may never know what yield losses they are suffering because of Pachymetra. This could make all the difference between profit and loss."

As part of a new project, SRA is investigating technology that could modernise and add value to the way these tests are conducted. Called PREDICTA, the technology could replace the manual method (counting the number of spores in a soil sample) by using DNA-based testing.

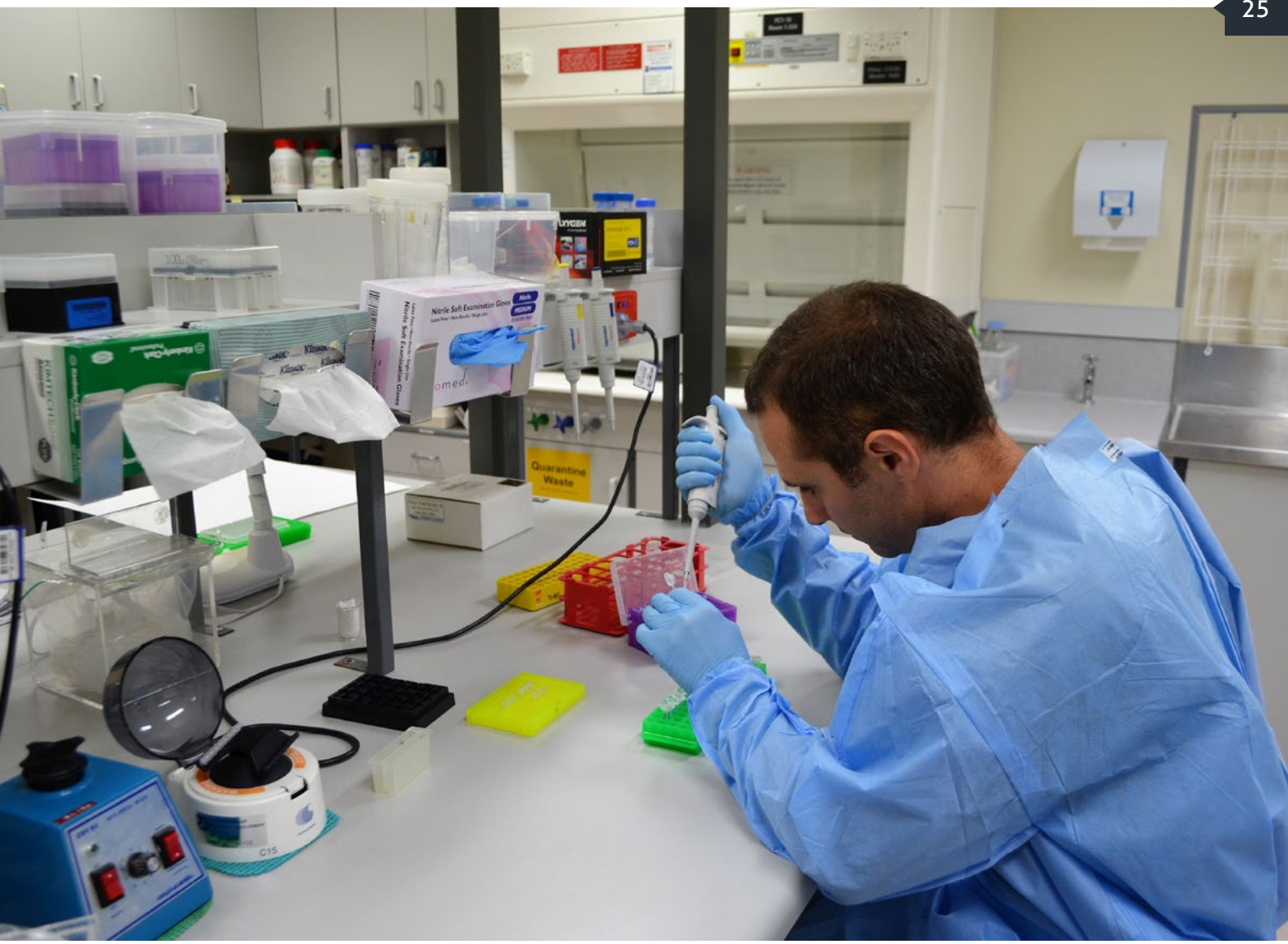
This technology is already well-established in the Australian grains industry and the South Australian Research and Development Institute (SARDI) is a major commercial provider of PREDICTA assays.

Over the last two years, Dr Magarey has been working with SARDI on understanding and refining how this technology could be applied to the Australian sugarcane industry.

The PREDICTA technology offers a range of advantages and opportunities. For example, current nematode assays are reliant on the nematodes being alive and therefore confidence in the result can be reduced in some situations.

"There has always been an element of uncertainty as to whether the counts you have reflect reality, or if the nematodes were killed by the heat," Dr Magarey explained. "Even an hour at 45 degrees can kill nematodes, which is not unreasonable in a car in North Queensland."

Working with SARDI, Dr Magarey said SARDI can now successfully assay for the



three pathogens – two nematode species and Pachymetra – from 500gm of soil.

"This was a major breakthrough, because a 1gm sample typically used for DNA studies doesn't tell you enough and might not have any representation of what is actually in the paddock."

Working with SARDI's expertise, facilities, and experience, Dr Magarey also worked on calibrating the test and comparing it to the current manual assay.

The results with the nematodes was near-perfect. For Pachymetra, the PREDICTA results were slightly less sensitive than the manual count, but still able to detect Pachymetra at levels that were below the economic threshold.

"In other words, if Pachymetra is there at levels that you need to know about, then the test will tell you," he said.

With the proof of concept complete, the next step will be to refine further details in bringing it to industry, which is currently part of a research proposal that is under consideration for funding by SRA.

Importantly, the project will need to ensure that SRA and productivity services organisations continue to have a good understanding of where these pathogens are occurring. History has shown the value of these organisations having their finger on the pulse of pathogen problems.

The economics of the new test also need to be assessed. In that context, future work may look at what other organisms could be added to the test to add value and make it more cost effective.

For example, the use of PREDICTA in the grains industry was recently expanded to 19 different diseases.

Dr Magarey said this work also had significant potential to link with current investments in soil health by SRA.

SRA will continue to keep the industry updated on the progress of this work and any changes that may occur in the future. Currently, the manual assay process is unchanged and ongoing. ■

(Over Page and Above) *Inside the South Australia Research and Development Institute laboratory.*

For more information, contact:
Dr Rob Magarey
E rmagarey@sugarresearch.com.au
T (07) 4088 0707

More information on management options for both nematodes and Pachymetra is available in the "pests and diseases" section of the SRA website.