

Research the key to a healthy pulse

By Rebecca Thyer

Researchers trying to improve the reliability of pulse production in the face of persistent disease pressures are hoping a new diagnostic tool developed at the International Centre for Agricultural Research in the Dry Areas (ICARDA) will speed up the development of more disease-resistant varieties in Australia.



[Photo (left) by Rebecca Thyer: Dr Safaa Kumari, centre, with collaboration colleagues Mohammad Aftab, left, Joop van Leur and Dr Angela Freeman.]

Joop van Leur, senior plant pathologist with the NSW Department of Primary Industries (DPI) in Tamworth, says that access to a fast, cheap and reliable diagnostic tool is crucial if pulses are to move from being an opportunity crop to becoming a dedicated industry.

However, breeding for disease resistance is particularly difficult in pulses because disease symptoms are often incorrectly diagnosed.

"Completely different viruses can cause symptoms that are indistinguishable in the field," Mr van Leur says.

For example, a widespread infection by bean leafroll luteovirus in northern faba bean fields during 2001 was mistaken for herbicide damage, while last spring agronomists diagnosed tomato spotted wilt virus as chocolate spot or root rot.

To improve early diagnosis, local researchers have been drawing on the experience of colleagues who have had decades of experience with pulses at ICARDA in Syria.

ICARDA's Dr Safaa Kumari visited Australia last year to work with local researchers on a GRDC-funded fellowship. Her virology laboratory at ICARDA has already developed a cheap and reliable diagnostic tool called Tissue Blot Immunoassays (TBIA).

Dr Kumari said TBIA testing had proved to be an appropriate technique for breeding programs and large-scale quantitative surveys.

This test is based on the same principles as ELISA, a fundamental tool in clinical immunology, with the presence of a virus determined by its reaction with a specific antibody.

TBIA tests have two advantages: easy preparation and large processing capabilities.

Dr Kumari said TBIA had allowed her to test 2000 samples a day for 14 viruses. "That's an awful lot of tests, but we can manage it with this technology."

Through ICARDA and Dr Kumari's work with the Victorian DPI, the efficiency and reliability of TBIA and other tests are being improved and are expected to lead to a better virus detection strategy.

While working at the Victorian DPI's Knoxfield laboratory, Dr Kumari described variation in a number of different virus genera, and opened a whole new avenue of possibilities to examine old samples by extracting DNA and RNA from TBIA membranes blotted several years ago.

Testing of years-old samples, either by TBIA or by molecular tools, has an important biosecurity benefit.

Dr Angela Freeman, a Victorian DPI senior plant virologist with grains biosecurity and quarantine roles, says TBIA tests are crucial in this regard.

"If quarantine reports an incursion of a disease, we can pull out our old samples and test them for this disease. Then we can safely say whether it's an incursion, or if this disease has been around for a while, but we couldn't previously test for it."

Although Dr Kumari's work at Knoxfield helped virologists gain a better understanding on relations between different pulse viruses, the overall aim remains to provide Australia's pulse improvement programs with practical tools to minimise virus losses.

"Pulses are still a young crop in Australia," Mr van Leur says. "We are relying on exotic germplasm to get the industry established. At the same time, we're breeding in a new environment and that's where the problems start. There is currently no preventive way to deal with pulse viruses, so we need to accurately describe what we're dealing with. You can only develop strategies if you know the nature of the beast. For resistance- breeding this is even more important.

"Improving TBIA testing and using it to create risk management strategies and new varieties will help ensure these crops reach their potential in Australia."

In recent years viruses have been a major production constraint for faba bean in northern NSW and retain the potential to also cause crop losses in South Australia and Victoria.

Mr van Leur says winter legumes such as faba beans, field peas, chickpeas, lentils and lupins tend to be more vulnerable to viruses than winter cereals. Viruses also have a wide range of hosts and insect vectors involved in the infection process.

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