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Cooperative Research Centre for Sustainable Rice Production

... of growing importance

Media Release

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Quality, cold tolerant rice varieties closer

The 'holy grail' of the rice industry, a cold tolerant, high quality variety is a step closer.

Reporting to an international cold tolerance workshop in Canberra Dr Tim Farrell has described using the cold tolerance of short season, poor quality Eastern European varieties in crosses with the mid-season Australian variety Millin. In what amounts to a significant breakthrough we now have a number of elite breeding lines combining the cold tolerance of the European varieties with the seasonal characteristics of Millin.

"Besides having poor quality, the European varieties have a very short growing season," said Dr Farrell. "That translates into lower yield. We now have breeding lines that are cold tolerant with similar growth duration as and the same seasonal length as Millin. We're talking about more yield per megalitre, greater water use efficiency."

Describing the European varieties as having a three to four degree lower damage threshold than the Australian benchmark variety Amaroo, Dr Farrell said that cold damage routinely robbed Australian farmers of more than three quarters of a tonne per ha yield in a season.

"One year in four they lose a tonne per hectare, one year in ten that loss is greater than two tonnes. They're significant financial penalties and at a time when there's even more emphasis on water use efficiency, represent lost opportunities. The best of the elite lines we're working with show only a third of the damage suffered by existing Australian varieties under the same conditions."

Under field conditions Amaroo begins to show the effects of cold damage at night temperature of about 16 degrees. One of the European varieties used by Dr Farrell, HSC55, can tolerate temperatures as low as 12 degrees before showing similar damage. That characteristic has been captured in 14 elite breeding lines.

"We've determined that a number of genes are involved in the characteristic of cold tolerance but significantly, there is no link between cold tolerance and growth duration of the plant," said Dr Farrell.

"It means that we can increase the cold tolerance of varieties with an optimum growth duration. Cold tolerance was found to be a highly heritable trait and there's no reason why we shouldn't be able to introduce this into high quality Australian varieties."

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In more good news for the industry Dr Farrell detailed techniques he'd developed for rapid early screening of crosses for cold tolerance. He's identified that the anther and stigma size of the plants are valuable indications of its cold tolerance and proved that a system of exposing plants to water at 19 degrees is an effective tool to screen varieties for cold tolerance.

"Spikelet sterility can be used as an indication of cold tolerance and, using cold water to challenge their early crosses, plant breeders could reject any plants with greater than 50 percent unfilled grains."

Asked how long it would be before a cold tolerant variety with good grain quality would be available, Dr Farrell suggested it should be a reality within five to seven years.

Dr Farrell's work was supported by the Cooperative Research Centre for Sustainable Rice Production. He is currently working at the University of Queensland as a Research Fellow charged with improving rice productivity in South East Asia.

"Cold damage is a problem shared across many rice growing areas," he said.

"Even in northern Laos, where my current work is centered, it's a problem. Not at the reproductive stage of the plant as it is here in Australia but during its establishment.

Developing cold tolerant varieties is essential right across the world's production areas."

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