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Cooperative Research Centre for Sustainable Rice Production

... of growing importance

Media Release

16 August, 2004

INSIDE THE COLD RICE PLANT

Australian scientists have taken an important step in the identification of a genetic marker associated with cold tolerance in rice plants.

Cold damage to rice is a problem in countries as diverse as Russia, China and Japan. In Australia it routinely reduces yield by about three quarters of a tonne per ha. In bad years losses can be as high as two tonnes per ha or more. Cold tolerant varieties hold the promise of greater water use efficiency and of boosting Australia's reputation as one of the most efficient rice producing countries in the world.

Identification of a genetic marker allows plant breeders to screen seedlings for the presence of a desirable characteristic rather than wait until the plant is mature. Knowledge of a marker associated with cold tolerance would allow them to short-cut the development of new varieties by a number of years.

Working with the backing of the Cooperative Research Centre for Sustainable Rice Production Sandra Oliver, Rudy Dolferus and a team of CSIRO scientists have identified the cause of cold damage in rice and a number of genes associated with the damage.

"What we've found is significant," she says. "It hasn't been done before. Other research groups around the world have been working to develop ways of screening new rice crosses for cold tolerance. We've worked from the other direction trying to establish how the damage is caused. We know the answer. We've identified some of the genes associated with the process and we have important leads for further development."

Presenting her work to an international workshop on cold tolerance in Canberra Miss Oliver explained that temperature affects the process of sugar metabolism in the rice plant.

"We've identified 3 main genes associated with the process of breaking down sucrose and transporting it throughout the plant. Under cold conditions some of these are 'switched off' and the pollen isn't able to manufacture the starch it needs as an energy source. Without pollen the plant is infertile and no grain is produced."

Miss Oliver used the cold-sensitive Australian variety Doongara and two cold tolerant Chinese varieties to test her hypothesis and found substantial differences in the way the genes were expressed between the varieties.

The Rice CRC is sponsored by the Australian Government's Cooperative Research Centres Program. The Centre coordinates the research activities of teams from Charles Sturt University, NSW Department of Primary Industries, CSIRO, Department of Infrastructure, Planning & Natural Resources, University of Sydney, SunRice and the Rural Industries Research & Development Corporation.

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“We need to verify these results by testing a range of varieties,” she says, “with the next step being the incorporation of this information by plant breeders in their work. Interestingly, there seems to be a similarity between the effect of cold stress on the rice plant and drought stress on wheat. It may even be that by identifying more cold tolerant varieties we’ll also be developing drought tolerant varieties.”

Japanese and Uruguayan delegates at the workshop showed a particularly keen interest in Miss Oliver’s work. “This isn’t just Australia’s problem it’s a significant cause of lost production right across the rice producing world and while other teams are concentrating on developing techniques for screening for cold tolerance we are at the forefront in working to determine the cause of the problem and looking for a solution there.”

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