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Cooperative Research Centre for Sustainable Rice Production

… of growing importance

Media Release

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BEATING RICE WEEDS NATURALLY?

World wide the rice industry is under attack from weeds. In Australia, three of the most important in aerial sown rice, dirty dora, starfruit and arrowhead are developing huge herbicide resistant populations and chemical companies are unlikely to commit research dollars to solve the problems of a relatively minor industry.

At Charles Sturt University with the backing of the Rice CRC Dr. Alexa Seal is taking a new route, she's identified a number of rice cultivars capable of suppressing some of the major weeds. The crop does it not by out competing the weeds but by excreting a mix of chemical compounds that suppress the weed plant. In effect it's a natural herbicide. It's known as an allelopathic action, something that occurs widely within the plant community, but the scientific community is divided over its practical application.

In laboratory and field trials Dr. Seal has evidence of a significant impact of some rice varieties against arrowhead and starfruit. In laboratory tests she compared the impact of 28 rice varieties from different countries, maturity and stage of improvement for their allelopathic effect on arrowhead and starfruit. Depending on the variety, the roots of the weed seedlings were reduced by between 26.6 percent and 99.7 percent.

"The rice and the weed seeds were pre-germinated and then sown into a beaker containing a simple water agar solution, there were no nutrients available to the plants. All sources of competition were excluded from the experiment so that only the rice root exudates could have an impact on the weed seedlings," she says.

In field trials at the Yanco Agricultural Institute in a year that favoured starfruit infestation she compared the effect of 24 rice varieties on the dry matter yield of the weed. Again, depending on the variety, yield of the weeds was reduced by between 25 percent and 90 percent and there was a good correlation between the most effective varieties in the laboratory and in the paddock.

"Eight out of the ten top allelopathic varieties in the laboratory were again the most effective in the paddock," she says. Dr Seal's next task is to identify the chemical or complex mix of chemicals involved. " That has tremendous implications for a future breeding program and for the identification of a natural herbicide mixture which could be used for weed control."

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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To date she has identified 25 of the chemicals released by rice seedlings and while there are differences between the amounts of these chemicals exuded by allelopathic and non-allelopathic cultivars none appear to be responsible for the allelopathic activity.

" It's most likely that a compound mixture rather than a single chemical will be responsible and it is possible that the allelopathic effects are due to breakdown products of certain chemicals in the soil rather than the compound released from the rice roots. Once we've identified the chemicals responsible for the observed allelopathic effect, work can begin on the isolation of the genes responsible for their production and we could begin the process of breeding rice varieties with a built in herbicide."

Dr Seal has already identified a range of allelopathic activity in current and recent Australian rice varieties. Amaroo is in the top ten allelopathic cultivars while Langi is non-allelopathic. Jarrah is another variety showing allelopathic promise.

This is not work that promises a quick fix. " We have made considerable progress in this field in the last three years," says Dr. Seal, " but there could be as much as ten more years work to identify the causal compounds. Then we'd have to start the breeding process."

- ENDS -

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