



RICE CRC

FINAL RESEARCH REPORT

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Title of Project :	Screening Reproductive-Stage Cold Tolerance for the NSW rice improvement program
Project Reference number :	2206
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SUMMARY

A summary of this work is provided. The rest of the report will subsequently be the basis for information contained in a thesis to be produced by John Smith, Masters student.

This project aimed at developing a clearly-defined and repeatable low-temperature screening protocol to enable selection for cold tolerance in the NSW DPI Rice Improvement Program. The series of trials identified a number of important issues that must be addressed when measuring tolerance to low temperatures during the reproductive stage of rice.

The capacity of the controlled-environment glasshouse to maintain the temperatures necessary to induce floret sterility is extremely important, as small deviations from both maximum and minimum temperatures can influence floret sterility. The controlled-temperature facility used at Deniliquin had limited capacity to maintain low temperatures during periods of high ambient minimum temperatures. The glasshouse in which plants are raised before and after cold treatment must also have good temperature control so that cold damage is not induced during these periods. Factors other than temperature also influence floret sterility, and this project demonstrated an effect of the position of the pot within the glasshouse, as well as an effect associated with plants were completely surrounded by others or at the edge of the plant canopy.

The project also investigated varying the period of exposure to low temperatures during the reproductive stage and found no significant effect of delaying exposure to low temperatures. Exposure commenced at the time of panicle initiation to 15 days after panicle initiation and terminated at anthesis. Floret sterility varied significantly between varieties, but the results were unusual in that the known cold-sensitive variety Doongara had low levels of floret sterility. There were also significant effects associated with the position of pots within the treatment room.

The temperature regime used to induce floret sterility was chosen based on previous experiments conducted at Yanco, but failed to produce high levels of floret sterility in many of the experiments. The reasons for this were not clear, but may be related to the nitrogen content of the plants when exposed to low temperatures. Preliminary analysis of nitrogen concentration of Doongara with two rates of applied N showed low N concentration (<1.0%) in plant tissue for each treatment. More detailed experiments investigating the role of nitrogen concentration are described, however the results of this experiment are not available at the time of writing. Complete results and analysis will be reported in the Masters of Philosophy thesis submitted by John Smith in November 2005.

The project has shown that screening for low temperature tolerance as an integrated function within the rice breeding program must take into account a range of factors. These include attention to experimental design to account for effects associated with pot position within the glasshouse and within the canopy. The controlled-environment facility must be able to maintain the required temperatures to induce floret sterility, These experiments suggest that the stage at which low temperature treatment commences (between 0 and 15 days after panicle initiation) is not as critical as having an appropriate combination of temperature and plant nitrogen status which induces significant floret sterility. This combination is yet to be determined.

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