

FINAL REPORT

DAQ472

Testing of Synthetic and Queensland Wheat Lines for Frost Tolerance after Heading

PROJECT DETAILS

PROJECT CODE: DAQ472

PROJECT TITLE: TESTING OF SYNTHETIC AND QUEENSLAND WHEAT LINES FOR FROST TOLERANCE AFTER HEADING

START DATE: 01.01.2000

END DATE: 01.01.2003

SUPERVISOR: DR ANDREW BORRELL (PRINCIPAL RESEARCH SCIENTIST)

ORGANISATION: QDPL/AGENCY FOR FOOD AND FIBRE SCIENCES/FARMING SYSTEMS INSTITUTE

CONTACT NAME: ANDREW BORRELL

Summary

The minimisation of frost damage is of paramount importance to growers and, as a consequence, GRDC has made it a major objective. The direct yield loss, due to spasmodic frosting of winter cereals in Queensland (QLD) and northern New South Wales (NSW), runs into millions of dollars annually. Growers minimise the risk of frost by planting later and by using longer season varieties. Unfortunately, these strategies, although currently essential, result in even greater losses as flowering departs from the optimal period for maximum yield potential. If frost tolerance after head emergence could be increased just 2°C, to approx. -6°C, the annual yield increase due to earlier flowering, would exceed 0.8t/ha throughout the northern region. An 0.8t/ha yield increase is common when earlier flowering crops escape damaging frosts. Estimates suggest yield increases of this level across QLD would result in increases in the order of approx. 50% in gross wheat production.

Report Disclaimer

This document has been prepared in good faith on the basis of information available at the date of publication without any independent verification. Grains Research & Development Corporation (GRDC) does not guarantee or warrant the accuracy, reliability, completeness or currency of the information in this publication nor its usefulness in achieving any purpose. Readers are responsible for assessing the relevance and accuracy of the content of this publication. GRDC will not be liable for any loss, damage, cost or expense incurred or arising by reason of any person using or relying on information in this

publication. Products may be identified by proprietary or trade names to help readers identify particular types of products but this is not, and is not intended to be, an endorsement or recommendation of any product or manufacturer referred to. Other products may perform as well or better than those specifically referred to. Check www.apvma.gov.au and select product registrations listed in PUBCRIS for current information relating to product registration.

Copyright

Grains Research and Development Corporation. This publication is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced in any form without written permission from the GRDC.

Old or Archival Reports (Projects that concluded in 2007 or earlier)

The information contained in these older reports is now several years old, and may have been wholly or partially superseded or built upon in subsequent work funded by GRDC or others. Readers should be aware that more recent research may be more useful for their needs. Findings related to agricultural chemical use are also potentially out of date and are not to be taken as a recommendation for their use.

Conclusions

The putative post-head emergence frost tolerance in the tested International Maize and Wheat Improvement Center (CIMMYT) synthetic wheat has either:

- a. Not been expressed at significant levels under QLD conditions, and/or
- b. Does not exist as tolerance per se, but rather as frost escape due to the long season nature of these types.

Hence, it is unlikely that useful levels (from a plant breeding perspective, $>0.8^{\circ}\text{C}$) of frost tolerance will be available from this material.

Recommendations

Tested lines including CIMMYT synthetics are currently not suitable for use in a frost tolerance (post-head emergence) breeding program.

Other research

Work performed by D. Woodruff and T. Frederiks outside the scope of DAQ472 has identified high levels of frost tolerance after head emergence in another grass species. This provides a unique opportunity to study mechanisms of frost tolerance. A project proposal DAQ00002 'Novel Approaches to In-Head Frost Tolerance' has been submitted to GRDC to explore this exciting new mechanism.