

Title: Molecular and phenotypic selection of gene-edited wheat lines to deliver enhanced frost tolerance

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Frost is a major abiotic stress which reduces the yields of wheat grown in WA. The overall aim of this project is to reduce the losses cause by frost events by increasing the expression of an anti-frost gene naturally present in wheat, using gene-editing technology. The rationale was that increased expression of the gene coding for the anti-freeze protein (AFP) and accumulation of this protein would help protect plants from frost events, particularly during flowering and early grain-filling.

Analysis of 165 T1 generation gene-edited edited wheat plants indicated that 65 lines had higher AFP gene expression at the booting stage, and 8 had higher expression at both the booting and grain-filling stages. Several lines with increased AFP expression exhibited improved recovery after sub-zero temperature treatments down to -5°C (Figure 1), and a putative edited candidate line was identified and has been submitted for regulatory review.

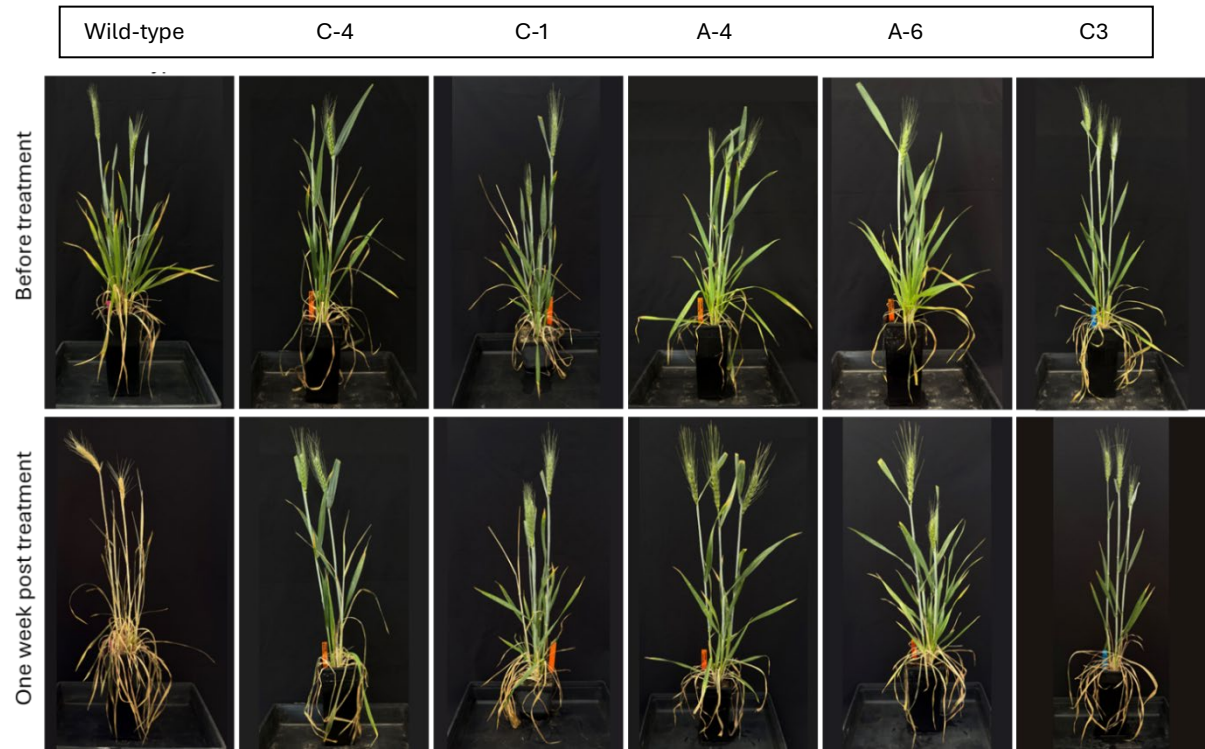


Figure 1. Wild-type plants and T3 lines before and one-week after treatment at -5°C at the anthesis stage. These five lines exhibited high AFP gene expression