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Identification of genetic variation in heat stress and mechanisms of tolerance in wheat

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Abstract

Extreme heat waves continue to occur across Australia, particularly in the Northern regions of New South Wales where temperatures exceed 35°C throughout summer. Wheat germplasm with superior tolerance to short but extreme heat waves (e.g., 1-3 days exceeding 35°C) compared to currently available wheat varieties was identified. Combinations of experimental approaches were used to impose heat stress in the greenhouse and the field. Two replicates of 120 genotypes were planted across four consecutive sowing dates with later sowings experiencing progressively higher temperatures. Using in-field heat chambers, high temperature stress was applied to a subset of ten genotypes thought to have a superior tolerance to heat at anthesis. To compensate for random seasonal weather effects, these experiments were concurrently replicated by imposing heat stress in a greenhouse facility. This provided side-by-side comparison of a range of commercial genotypes grown widely in northern NSW. Yield and quality stability were the primary measures of temperature tolerance. Other variables that discriminated for response to high temperature included seed set, seed size and seed yield.

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