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Abstract

Increasing Heat Tolerance in Wheat to Counteract Recent and Projected Increases in Heat Stress †

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Abstract: The frequency of heat shocks during grain filling of wheat crops across the Australian wheatbelt has significantly increased over the last 30 years. These post-flowering heat events significantly reduce wheat yields with a relatively greater impact on grain size than grain number. A controlled environment study was conducted to assess the impact of post-flowering heat shocks on wheat recombinant inbred lines SB062 and SB003. Plants were submitted to 7-day heat shocks (33/21 °C day/night temperature) at different periods during grain filling. Heat shocks significantly accelerated leaf senescence, with a greater impact on older leaves and for mid post-flowering stresses. Overall, the tolerant line (SB062) could maintain leaf greenness longer than the sensitive line (SB003), especially when submitted to heat stress. Further, heat shocks during early-to-mid grain filling reduced the grain size and weight. While the impact on developing grains was significant in SB003, no significant effect of post-flowering heat was observed on leaf senescence nor on grain size in the tolerant line SB062. Delayed leaf senescence appeared to play a role in maintaining grain size under heat stress. The research findings will assist improving crop models for post-flowering heat effects and developing techniques for screening heat tolerant wheat lines. Increased post-flowering assimilate production through sustained leaf greenness could improve the performance of wheat crops in increasingly warmer environments.

Keywords: biomass partitioning; heat adaptation; heat tolerance; phenotyping; stay-green