



Wider and Faster: High-Throughput Phenotypic Exploration of Novel Genetic Variation for Breeding High Biomass and Yield in Wheat

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Abstract

The rate of genetic progress in biomass production per unit hectare of wheat must be improved if we are to meet global targets for grain production. However selection for domestication traits has reduced the genetic variation in modern wheat cultivars, a fact that could severely limit the future rate of genetic gain. Wild relatives and landraces of wheat carry considerably more variation for target traits than modern day wheat varieties including substantial variation in photosynthesis; a direct factor in biomass production. The aims of this project are to (1) Generate, using wide crosses, landraces and existing cultivars, lines with substantial variation in their photosynthetic properties. (2) Use novel high throughput screening techniques to identify progeny with enhanced photosynthetic capacity and efficiency, robustly expressed across environments, and which increase wheat biomass production and yield. (3) Investigate the genetic basis of the photosynthetic variation and with the IWYP HUB integrate these discoveries into a pre-breeding and breeding strategy. (4) Coordinate key centres of excellence to create a virtual crop photosynthesis hub for high throughput screening and analysis.

This strategy will enable our consortium to meet all of the requirements of the IWYP Research area A/B call, in particular uncovering new genetic variation in relatives and ancestors of wheat and novel optimized smart screens for photosynthesis.