IWYP International Wheat Yield Partnership

Research to Deliver Wheat for the Future

Realising Increased Photosynthetic Efficiency to Increase Wheat Yields

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Abstract

Numerous studies of the effects of CO_2 enrichment in the field, including wheat, show that increased crop yields can be obtained through increased photosynthetic carbon assimilation. Furthermore, experiments conducted in the applicant's laboratories on transgenic plants, in which activities of individual enzymes were altered, provided evidence that manipulation of the Calvin cycle has the potential to improve photosynthesis and increase plant productivity. These studies together with integrated systems modelling identified photosynthetic carbon assimilation as an untapped target to increase photosynthetic efficiency and yield by as much as 60%. The overall aim of this project is to exploit the extensive knowledge of photosynthesis and experience gained from its manipulation in model species to produce wheat plants with enhanced photosynthetic performance and increased yield. We will undertake growth, yield, physiological and molecular analysis of transgenic plants in high-light controlled environments, and test the most promising

events these in replicated field trials in the UK and in Illinois. Given that our aim is to further increase yields we will be using two modern top yielding cultivars one adapted to W. European temperate conditions and the other to the US Midwest with high humidity and high temperature. Each will be tested in replicated trials in their “native” environments. Use of these two very different growing environments and genetic backgrounds will test the broader efficacy of the transgenic modifications to provide a sound basis for the production of higher yielding varieties for the developing world. This project not only has the potential to produce a step change in yield of wheat to meet the predicted future needs to feed the growing population, but will also provide the means to achieve this within the timescale needed.