Enhancement of plant vision to increase drought tolerance and bioproduction

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Energy needs of the worlds growing population have become central issues to policy and science discussion over the past few years. Not only are our non-renewable sources of energy being depleted at alarming rates, their consumption is also a major contributor to the accumulation of atmospheric greenhouse gases. It is clear that new solutions to old problems must be found, and in this context the production and harnessing of biofuel products holds great promise. Plant-based bioproduction has the great advantage that biofuel production can be creatively couple with food production, another pressing 21st Century issue. Water availability represents the major limitation to increased plant-based production, both in the U.S. and around the world. Therefore development of plants that are better able to access and utilize this limiting resource is paramount.

Our studies in the model plant *Arabidopsis thaliana* have shown that mutants lacking the key photoreceptor protein, phototropin 1 (phot1), that mediates a plants response to directional blue light fail to orient their root growth properly and thus exhibit increased drought susceptibility (Galen et al. 2004, 2007). Conversely, mutations in phot1 that confer increased responsiveness to blue light appear to increase drought tolerance.

We are now exploring ways to recapitulate this exciting phenotype through the generation of GMOs, both in this model species and in crop plants. This approach holds great potential as even minor increases in drought tolerance in plants can result in dramatic increases in bioproduction, the ultimate goal of a plant-based biofuels industry.