Determining the Functions of Novel Genes Required for Photosynthesis

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As land available for agriculture remains limited, it is becoming more necessary to explore methods to improve the efficiency of crop production in order to support Earth's growing populations. Newly characterized photosynthetic genes could improve our understanding of the way organisms convert light energy into fuel, allowing improvements in plant growth and environmental resistance. Using an insertion mutant library of the unicellular algae, *Chlamydomonas* reindhartii, that covers 83% of its genome, we are identifying and characterizing the hundreds of genes associated with photosynthesis. *Chlamydomonas* can be grown with or without a light source, which allows us to identify mutants displaying a photosynthesis-deficient phenotype. This work focuses on validating the hypothesized mappings of the photosynthetic genes within the genome to improve confidence of identification. Once identified, we amplify the gene of interest using colony PCR in mutant and wild-type DNA to visualize differences in the DNA segment length to validate the insertion location. Preliminary tests have validated the location of 77% of a large subset of 270 photosynthetic candidate genes, while the other 23% of the subset was incorrectly mapped or required further testing. Once gene loci are confirmed, we can perform further experiments to characterize their specific roles in photosynthesis. In the future, the genes identified and characterized from these studies may be useful in genetically modifying higher-order plants with the intention of increasing crop yields.