

GENOMICS OPTIMIZATION TO IMPROVE THE PHOTOSYNTHETIC PRODUCTIVITY OF PLANTS AND ALGAE

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ABSTRACT

Photosynthetic plants and algae assemble large chlorophyll antenna in order to maximize survival in natural environments (where solar light is often limited). However, this property of plants and algae is suboptimal to productivity in high-density farming under direct sunlight. The reason is that in cultivated settings (where solar intensity is often deliberately high), the chlorophyll antenna in the top few layers of biomass have a photo absorption rate that far exceeds their photosynthesis rate -- resulting in dissipation and loss of excess photons as heat or fluorescence.

These losses are compounded by photo-inhibition at the top layers of the biomass, and strongly attenuated light at the bottom layers of the biomass. In fact, up to 80% of absorbed photons can be wasted thereby reducing solar conversion efficiencies and cellular productivity to unacceptably low levels.

To address these problems, researchers at UC Berkeley have developed a novel genetic technique that produces plants and algae with smaller, truncated chlorophyll antenna. Plants and algae with this attribute decrease over-absorption and wasteful dissipation of light in the top layers of biomass and also decrease photo-inhibition at the surface while increasing transmittance of light deeper into the biomass.

Experiments conducted by the Berkeley research team have confirmed that cultures with this smaller chlorophyll antenna result in greater photosynthetic productivity and enhanced solar conversion efficiency.

APPLICATIONS

Cultivation of algae or plants for bio-fuels, food production, or carbon sequestration

ADVANTAGES

Greater photosynthetic productivity

Enhanced solar energy conversion

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	7,745,696	06/29/2010	2006-132

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OTHER INFORMATION

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CATEGORIZED AS

» **Energy**

» Other

» **Medical**

» Gene Therapy

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