Modelling of light driven CO2 concentration gradient and photosynthetic carbon assimilation flux distribution at the chloroplast level

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The steady state of the two-substance model of light driven carbon turnover for the photosynthetic CO2 assimilation rate is presented. The model is based on the nonlinear diffusion equation for a single chloroplast in the elliptical geometry by assuming light driven Ribulose-1,5-bisphosphate (RuBP) regeneration and CO2 assimilation reaction of carboxilation coupled with the photosynthetic sink strength. The detailed analysis of 3 -dimensional CO2 concentration and flux on the chloroplast level is made. It is shown that under intense light irradiation there exists a boundary layer of chloroplasts with a high value of CO2 assimilation flux. The presented simplified model can be used for the calculations and experimental estimations of the CO2 assimilation rate for environmental applications.

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