第 1247 回　生物科学セミナー

The role of cytosolic carbonic anhydrase activity for C_3 photosynthesis

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場所　理学部２号館　大講堂

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Abstract

C_3 mesophyll cells have a relatively high abundance of carbonic anhydrase (CA) in the cytosol. The role of this cytosolic CA is puzzling considering that C_3 plants in contrast to C_4 plants do not sustain high phospho*enol*pyruvate carboxylase activity in the mesophyll. By using combined genetic and functional approaches complemented with modelling, we addressed the quantitative role of cytosolic CA activity for C_3 photosynthesis. Using ^{18}O-labelled CO_2 and mass spectrometry for monitoring the rate of oxygen atoms exchange between CO_2 and mesophyll water, the kinetic properties of CO_2 diffusion and hydration into the leaf *in vivo* were investigated. Using various CA knock-out mutants, we estimated CA activity *in folio*, particularly, in the cytosol compartment, as well as the CO_2 transfer conductance between the atmosphere and the location of the different CA isoforms in the leaf. The comparison between this CA-based assay and a classic assay of mesophyll conductance (Rubisco-based) allowed us to describe the components of CO_2 transfer in the liquid phase. Analysing the relationships between growth, assimilation, mesophyll and stomatal conductances and their CO_2 responses in the light of the cellular localisation and activities of CAs, we evaluated the role of cytosolic CAs in CO_2 transport and in optimising efficiency of photosynthetic carbon gain.

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