



若手イニシアティブセミナー

(Presentation in English)

AtGTL1* regulates transpiration and water-use efficiency by controlling stomatal number through transcriptional repression of *SDD1

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Improving plant drought tolerance and water-use efficiency (WUE) are global priorities to enhance biomass production and/or yield stability in the face of decreasing fresh water availability. Herein, evidence is presented that establishes the *Arabidopsis* GT-2 like 1 (GTL1) trihelix transcription factor as a negative regulator of WUE by controlling stomatal density and, in turn, transpiration through *trans*repression of *SDD1* (*STOMATAL DEVELOPMENT AND DISTRIBUTION1*). *gtl1* T-DNA insertional mutations (*gtl1-4* and *gtl1-5*) enhanced survival of *gtl1* plants to water-deficit stress by facilitating the maintenance of leaf water content. *gtl1* plants had lower light-period but not dark-period transpiration rates, without a concomitant reduction in CO₂ assimilation or biomass accumulation, resulting in improvement of WUE. Abaxial stomatal density was lower in fully expanded leaves of *gtl1* plants, which reduced transpiration but did not affect photo-assimilation. *gtl1* mutations up-regulated the expression of *SDD1*, a negative regulator of stomatal density. The stomatal development pathway that is repressed by *SDD1* to control stomatal density was upregulated by *gtl1*. *In vitro* DNA-binding and *in vivo* chromatin-immunoprecipitation assays revealed that GTL1 binds to a GT element (GT3-box: GGTAAG) in the *SDD1* promoter. These results indicate that GTL1 functions as a transcriptional repressor of *SDD1* to regulate stomatal density, transpiration and WUE.

<Reference>

Yoo, Pence, Hasegawa (2009) Crit Rev Plant Sci 28:410-431

Yoo, Pence, Jin, Miura, Gosney, Hasegawa, Mickelbart (2010) Submitted

Miura, Hasegawa (2010) Trends Cell Biol In press

Mike Hasegawa 博士は植物の非生物学的ストレス応答に関する研究を長年行っており、その業績から ISI Highly Cited Researcher-Plant and Animal Science に選出されています。また、最近では Plant Physiology, Plant Journal, PCP の Editor も務めておられ、植物科学分野の発展に寄与してこられました。今回は最新の研究成果である気孔発達の制御と乾燥ストレス応答に関する研究について紹介して頂く予定です。多数の皆様のご来場をお待ちしております。

(本セミナーは筑波大学若手イニシアティブ主催セミナーです。)

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