Institute Interest Seminar Series, I^{2}CNER
March 11, 2015

Insight into CO_2 signal transduction mechanisms in stomatal guard cells

Juntaro Negi, Koh Iba
Department of Biology, Faculty of Sciences, Kyushu University, Japan

Carbon fixation is a biochemical process by which atmospheric CO_2 is incorporated by plants and into energy-rich organic molecules such as glucose, thus creating their own food by photosynthesis. Photosynthesis uses CO_2 to produce sugars from which other organic compounds can be constructed. CO_2 is not only a carbon donor for photosynthesis, but also acts as an environmental signal that regulates movements of a stoma, a highly specialized organ that consists of a pair of guard cells and regulates gas and water vapor exchange in plants. High CO_2 concentrations reduce stomatal aperture, whereas low concentrations trigger stomatal opening. In contrast to our advanced understanding of light and drought stress responses in guard cells, the molecular mechanisms underlying stomatal CO_2 sensing and signaling are largely unknown.

Leaf temperature provides a convenient indicator of transpiration, and can be used to detect mutants with altered stomatal control. To identify genes that function in CO_2 responses in guard cells, CO_2 insensitive mutants were isolated through high-throughput leaf thermal imaging (Fig.1). The isolated mutants are categorized into three-groups according to their phenotypes: (1) impaired in stomatal opening under low CO_2 concentrations; (2) impaired in stomatal closing under high CO_2 concentrations; (3) impaired in stomatal development. Characterization of these mutants has begun to yield insights into the mechanisms of stomatal CO_2 responses. We will discuss the current status of functional analysis of identified CO_2 regulators and future prospects.

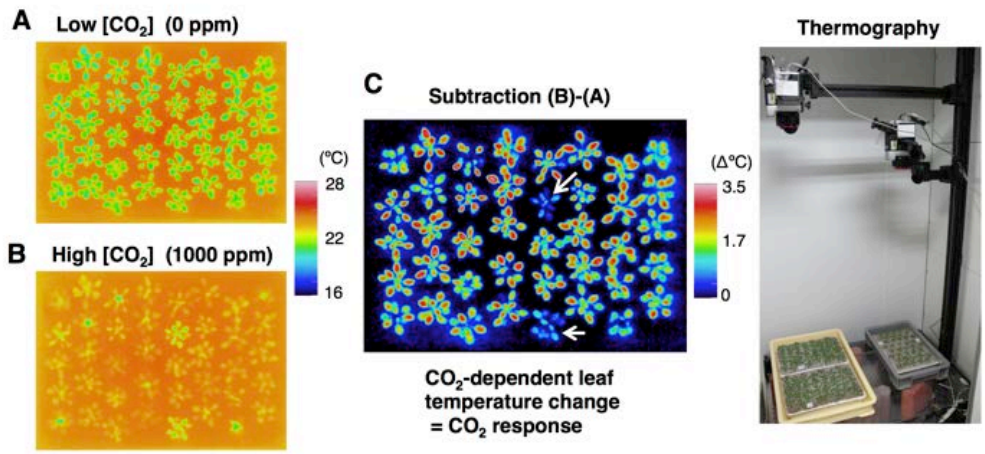

Fig. 1