A new transporter gene that regulates plant transpiration

September 9 2011

When plants feel stress from a lack of water, they close their epidermal pores, or stomata, to prevent water loss via transpiration. Each stoma is flanked by a pair of guard cells, which change shape to close or open stomata through the exchange of various biological materials. Guard cells therefore play an important role in water evaporation by responding to environmental conditions and stress. However, the mechanisms that control the opening and closing of stomata are not fully understood.

PSC's Gene Discovery Research Group has identified a new transporter gene that is expressed in guard cells and controls the opening and closing of stomata. The group found that when this gene is deficient, guard cells have difficulty closing, which results in greater transpiration. Using thermal imaging to observe transpiration in Arabidopsis thaliana, researchers observed that transpiration increased in mutants with the AtABCG22 gene, which belongs to the ABC family of transporter genes.

The stomata in this mutant open easily, leading to increased transpiration. When water was withheld, the mutant wilted before its wild-type counterpart. AtABCG22 is expressed in above-ground leaves and especially in stomatal guard cells. When AtABCG22 protein was inserted into onion cells and plant cultured cells, the protein localized in cell membranes, indicating that AtABCG22 is involved in transporting biological materials into or out of guard cells.

If the mechanisms regulating opening and closing of stomata can be clarified, it should provide new insights that can be use to improve crop

yields and adapt breeds for arid conditions.

Provided by RIKEN