

Identification of novel peptide hormones in plants

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Cell-to-cell signaling mediated by secreted ligands and membrane-localized receptors is one of the critical mechanisms by which growth and development of multicellular organisms are cooperatively regulated. Because membrane-localized receptors act as master switches of complex intracellular signaling, identification of the ligand-receptor pair is one of the central issues of post-genome research. Following complete sequencing of the *Arabidopsis* genome, a number of genes encoding small secreted peptides have been identified. We are working to clarify the mechanisms by which plant development is regulated, through identification of novel ligands such as small secreted peptides and their specific receptors using *Arabidopsis* genome information, biochemical analysis and phenotypic observation. Root meristem growth factor (RGF) is a 13-amino-acid peptide that regulates root meristem development through the PLETHORA (PLT) stem cell transcription factor pathway. RGF family peptides are expressed in stem cell area in the root tip and create a diffusion-based concentration gradient in the root meristem. RGF is recognized by an LRR-receptor kinase (LRR-RK), RGFR, and defines PLT expression in the proximal meristem, thereby acting as a key regulator of root meristem patterning. C-terminally encoded peptide (CEP) is a 15-amino-acid peptide that mediates long-distance nitrogen (N)-demand signaling. When external N availability is lowered, CEP expression is promptly upregulated in roots. CEP acts as a root-derived ascending N-demand signal to the shoot, where its perception by an LRR-RK, CEPR, leads to the production of a putative shoot-derived descending signal that upregulates nitrate transporter genes in the distant part of the roots. This mechanism supports N acquisition when nitrate is unevenly distributed within the soil.

References

- (1) Tabata R., Sumida K., Yoshii T., Ohyama K., Shinohara H., Matsubayashi Y. Perception of root-derived peptides by shoot LRR-RKs mediates systemic N-demand signaling *Science* 346, 343-346 (2014)
- (2) Matsuzaki Y., Ogawa-Ohnishi M., Mori A., Matsubayashi Y. Secreted peptide signals required for maintenance of root stem cell niche in *Arabidopsis*. *Science* 329, 1065-1067 (2010)