

論文内容の要旨

論文題目 : Characterization of *too much love*,
a novel hypernodulating mutant of *Lotus japonicus*
(ミヤコグサ新奇根粒過剰着生変異体 *too much love* の解析)

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Legume plants tightly control the development and number of symbiotic root nodules. In a model legume *Lotus japonicus*, this regulation requires HAR1 (a CLAVATA1-like receptor kinase) in the shoots, suggesting that a long-distance communication between the shoots and the roots may exist. To better understand its molecular basis, I characterized a novel hypernodulating mutant of *L. japonicus* named *too much love* (*tml*), which was previously isolated through ion-beam mutagenesis. Compared to wild type, *tml* mutants produce much more nodules which densely cover a wider range of the roots. To locate the site of action of *TML*, I first established a new highly-efficient grafting method for *L. japonicus*, which can accomplish super-high success rates up to ~80 %. By taking advantage of this effective grafting approach, I elucidated that *tml* hypernodulation is determined by the root genotype. Moreover, grafting a *har1* shoot

onto a *tml* rootstock did not exhibit any obvious additive effects on the nodule number, which was further supported by double mutant analysis. These observations indicate that a shoot factor *HARI* and a root factor *TML* participate in the same genetic pathway, which governs the long-distance signaling of nodule number control. I developed another novel grafting technique called inverted-Y grafting and showed that the inhibitory effect of *TML* on nodulation is likely to be local. Therefore, *TML* may function downstream of *HARI* and the gene product TML might serve as a receptor/mediator of unknown mobile signal molecules that are transported from the shoot to the roots. However, map-based and transcript-based cloning approaches identified a large genomic lesion encompassing at least 45 ORFs in *tml*; hence, the causative gene(s) for *tml* hypernodulation remains unknown.