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Signaling peptides acting in the systemic regulation of root system architecture in legumes

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Abstract

Plant growth is limited by soil nutrient availability and symbiotic nitrogen-fixing nodulation allows legume plants to use the atmospheric nitrogen source as an alternative. Legumes tightly regulate nodule number to balance the cost of supporting symbiotic rhizobial nitrogen-fixing bacteria growth with nitrogen fixation's benefits. Two antagonistic pathways involving signalling peptides regulate nodule numbers systemically from shoots: under low nitrogen conditions, CEPs (C-terminally Encoded Peptides) are produced in roots and promote rhizobial infection and nodule formation through the CRA2 (Compact Root Architecture 2) Leucine-Rich Repeats Receptor-Like Kinase (LRR-RLK) acting in shoots; and after symbiotic rhizobia have initiated nodulation, CLE (CLAVATA3-like) peptides are produced to limit the energetically costly nodulation in relation to the plant's needs, through the SUNN (Super Numeric Nodules) LRR-RLK receptor acting in shoots. Molecular mechanisms explaining how these two signalling peptide hormonal pathways are coordinated to fine-tune nodule number remains however poorly understood. Progress will be reported on different aspects of these peptide systemic signalling pathways, notably in relation wih their interaction with other types of hormonaregulations and with the characterization of potential common downstream shoot-to-root signals.