Uncovering The Role Of Gibberellin In Nodulation: Gibberellins Restrict Rhizobial Infection In The Epidermis And Promote Nodule Organogenesis In The Endodermis And Regulate Key Nodulation Genes

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Legumes associate with rhizobia to access to atmospheric nitrogen in root nodules. This symbiosis requires the precise coordination of rhizobial infection in the epidermis and nodule formation in the inner root layers. Plant hormones play important roles in regulating these processes, with their spatial and temporal activation dictating nodulation progression. We employed a powerful approach of specific epidermal and endodermal complementation of severely gibberellin-deficient *na* pea mutants, coupled with a novel comparison strategy of RNA-seq gene expression data from tissue-specific complemented roots, which allowed the dissection of genes possibly regulating specific nodulation stages. Our findings reveal that gibberellins restrict epidermal infection, limiting bacterial entry and regulating infection thread progression and branching in the cortex. Moreover, we found that gibberellins are essential in the endodermis to promote nodule and lateral root development. In contrast, gibberellin presence in the epidermis does not affect nodule or root development. Careful comparison of RNA-seq data of epidermal and endodermal complemented and control *na* mutants allowed the identification of genes potentially involved in the regulation of infection and nodule organogenesis downstream of gibberellin. These include the transcription factors *NSP1* and *NSP2*, ethylene response factors *ERN1* and *ERN2* and flavone synthase *FNSII*, along with genes important for nodule organogenesis and symbiosome formation. Future studies could target selected candidate genes to determine their precise role in nodulation and their regulation by gibberellin. This knowledge will facilitate the integration of the roles of plant hormones in nodulation and root development processes and the gene expression networks behind these processes.