

The plant hormones gibberellins (GAs) and auxin display overlapping activities in the regulation of multiple developmental processes, including the differential growth that mediates the response to tropic stimuli and the formation of the apical hook. Several mechanisms have been proposed that explain the interaction between these two hormones, such as the regulation of auxin transport by GAs, and the regulation of GA biosynthesis by auxin. GAs are known to exert their action at the transcriptional level by promoting the degradation of DELLA proteins, which in turn interact with numerous transcription factors and modulate their activity. We have identified *INDOLE-3-ACETIC ACID METHYLTRANSFERASE 1 (IAMT1)* as one of the earliest target genes upregulated after conditional expression of the DELLA protein GAI in *Arabidopsis thaliana*. In this Thesis, we have addressed two main issues: (1) the contribution of IAMT1 to auxin homeostasis and its biological relevance; and (2) the molecular mechanism by which DELLAs are able to induce the expression of *IAMT1*.

Using combinations of *iamt1* loss-of-function mutants and reporter lines for auxin accumulation and activity, we have found that IAMT1 activity is essential for proper generation and maintenance of the auxin gradients that underlie differential growth. According to our results, the role of IAMT1 would be to restrict polar auxin transport especially during the response to tropic stimuli, preventing excessive auxin accumulation in the responding tissues, and IAMT1 exerts this function, at least in part, by inhibiting the expression of the *PIN* genes, encoding auxin efflux carriers.

Regarding the regulation of *IAMT1* expression by DELLAs, dissection of the promoter, in silico analysis of putative DELLA partners, and molecular genetic analysis of reporter lines has allowed us to identify two mechanisms with different relevance depending on the environmental conditions, and through different *cis* elements. In etiolated seedlings, DELLA proteins are recruited by DORNRÖSCHEN (DRN) to the *IAMT1* promoter to induce *IAMT1* expression. In the light and in a temperature-dependent manner, DELLA proteins inhibit the DNA-binding activity of PHYTOCHROME-INTERACTING FACTOR4 (PIF4) and BRI1 EMS-SUPPRESSOR1(BES1), which act as repressors of *IAMT1* expression.

The work presented here highlights how GAs may affect local accumulation of auxin, being particularly relevant in processes that involve differential growth.