



## **ABSTRACT**

*“Waking up in time, seed dormancy explained at the molecular level”*

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Viable plant seeds are not always able to germinate and can cycle between a dormant and a non-dormant state. Dormancy prevents germination during unfavourable seasons, an ability that has been lost in most of our crop species. In the model plant *Arabidopsis*, dormancy is induced during the maturation of seeds in the silique and released by imbibition of seeds at low temperatures (stratification) or dry storage (after-ripening). Seed dormancy is determined by the balance between the plant hormones abscisic acid and gibberellins. However, our knowledge about the molecular identity of dormancy and its control by environmental factors is limited. To reveal the molecular mechanisms that determine the induction and release of seed dormancy, my research group has analysed and cloned *Arabidopsis* mutants with reduced dormancy levels. The underlying genes could be divided in two groups.

The first group contains ubiquitously expressed genes with a general role in plant development. Transcription factors, associated with elongating RNA polymerase II, are overrepresented in this group. Most of these genes are upregulated towards the end of seed maturation. Interestingly, this upregulation is correlated with a strong reduction in nuclear size during seed maturation. This suggests that RNA polymerase associated factors are required to facilitate gene expression in nuclei with reduced volume. An example of a gene belonging to this group is *HUB1*, which encodes a C3HC4 RING finger protein that is required for monoubiquitination of histone H2B. We observed altered expression levels for several dormancy genes in the *hub1* mutant towards the end of seed maturation.

The second group consists of dormancy genes with a seed-specific expression. The gene *DELAY OF GERMINATION 1 (DOG1)*, which is expressed during seed maturation and encodes a protein with unknown function, belongs to this group. *DOG1* is essential for seed dormancy because the *dog1* mutant is completely non-dormant. *DOG1* expression is upregulated by reduced temperatures during seed maturation. Higher levels of *DOG1* protein in ripe seeds require an increasing after-ripening time to release seed dormancy. *DOG1* is alternatively spliced and we have shown that *DOG1* function requires binding between its different protein isoforms.

In this seminar, I will present our present understanding of the molecular mechanism of seed dormancy in *Arabidopsis* and focus on the roles of RNA polymerase II associated factors and *DOG1*.