

Evolution of DELLA proteins and their role in plant growth control

Yuki Yasumura and Nicholas P Harberd

John Innes Centre, Colney, Norwich, NR4 7UH, UK
e-mail: yuki.yasumura@bbsrc.ac.uk, tel:+44 (0)1603 450517

DELLA proteins play a key role in growth regulatory signalling pathways in plants. This group of proteins act as growth repressor, and were initially identified as components of Gibberellin (GA) signalling. The application of GA leads to rapid degradation of DELLA proteins, thereby relieving the growth repression. Recent studies have revealed that DELLA proteins are involved in the signalling pathways which originate from other plant hormones such as auxin and ethylene, and also the environmental stress. This suggests that they are important targets for the integration of growth regulatory inputs from multiple signalling pathways.

DELLA proteins have been isolated from a number of angiosperm species, including *GA-INSENSITIVE (GAI)* and *REPRESSOR OF GA1-3 (RGA)* of *Arabidopsis* and *SLENDER RICE (SLR)* of rice. So far, DELLA proteins have been studied only in angiosperm. To gain insights into the evolutionary history of this protein family, we identified DELLA-related proteins in a lycophyte species (*Selaginella kraussiana*) and a bryophyte species (*Physcomitrella patens*). Their plant groups first appeared around 400 million years ago (MYA) and 430 MYA respectively, and are considered as ancient plant groups. The project aims to determine the role of DELLA-related proteins in these different plant groups, and to find out to what extent the function of the DELLA proteins is conserved across the land plants. Interestingly, the DELLA domain, which is highly conserved among angiosperm DELLA proteins, is present in *S. kraussiana* but seems absent in *P. patens*. Since deletion of DELLA domain confers a severe dwarf phenotype (such as in the *Arabidopsis gai* mutant), this domain is thought to be one of the key domains involved in GA-dependent protein degradation. Would the DELLA-related protein of *P. patens* be able to respond to GA? Does it act as a growth repressor? Can it functionally replace *RGA* in *Arabidopsis*? Finding answers to such questions may help us to understand how DELLA proteins have evolved to regulate plant growth.