Selective degradation of Aux/IAA proteins modulates plant development

Thomas Vain[1], Noel Ferro[2], Deepak Kumar Barange[1], Qian Ma[1], Mattias Thelander[3], Barbora Pařízková[4], Ondřej Novák[4], Siamsa M. Doyle[1], Alexandre Ismail[5], Per Anders Enquist[6], Adeline Rigal[1], Yi Zhang[7], Malgorzata Langowska[1], Karin Ljung[1], Judy Callis[8], Fredrik Almqvist[9], Mark Estelle[7], Laurens Pauwels[10] and Stéphanie Robert[1]

[1]Umeå Plant Science Centre, Department of Forest Genetics and Plant Physiology, Swedish University of Agricultural Sciences, [2]Institute of Physical and Theoretical Chemistry, University of Bonn, [3]Department of Plant Biology, Uppsala BioCenter, Swedish University of Agricultural Sciences and Linnean Centre for Plant Biology in Uppsala, [4]Laboratory of Growth Regulators, Centre of the Region Haná for Biotechnological and Agricultural Research, Faculty of Science of Palacký University & Institute of Experimental Botany CAS, [5]Sup'Biotech, IONIS Education Group, [6]Laboratories for Chemical Biology Umeå, Chemical Biology Consortium Sweden, Department of Chemistry, Umeå University, [7]University of California San Diego and Howard Hughes Medical Institute, [8]University of California, Davis Department of Molecular and Cellular Biology, [9]Umeå University, Department of Chemistry, Umeå University, SE-90187 Umeå, Sweden, [10]Department of Plant Systems Biology, VIB

Auxin phytohormones control most aspects of plant development through a complex and interconnected signaling network. In the presence of auxin, AUXIN/INDOLE-3-ACETIC ACID (Aux/IAA) transcriptional repressors are targeted for degradation by the SKP1- CULLIN1-F-BOX (SCF) ubiquitin-protein ligases containing TRANSPORT INHIBITOR RESISTANT 1/AUXIN SIGNALING F-BOX (TIR1/AFB). Here, we report four small molecules named DEVELOPMENTAL REGULATORS (DRs) requiring AXR1 and $SCF^{TIR1/AFB}$ to modulate plant development. Three DR molecules trigger selective auxin responses at transcriptional, biochemical and morphological levels which are explained by their ability to promote the interaction between TIR1 and a specific subset of Aux/IAA proteins. These results demonstrate the potential of selective auxin agonists to reprogram plant development through a selective degradation of the Aux/IAA transcriptional repressors.