

## **Arabidopsis REI-LIKE proteins activate ribosome biogenesis during cold acclimation**

### **ABSTRACT**

Arabidopsis REIL proteins are cytosolic ribosomal 60S-biogenesis factors. After shift to 10 °C, reil mutants deplete and slowly replenish non-translating eukaryotic ribosome complexes of root tissue, while controlling the balance of non-translating 40S- and 60S-subunits. Reil mutations respond by hyper-accumulation of non-translating subunits at steady-state temperature; after cold-shift, a KCl-sensitive 80S sub-fraction remains depleted. We infer that Arabidopsis may buffer fluctuating translation by pre-existing non-translating ribosomes before de novo synthesis meets temperature-induced demands. Reil1 reil2 double mutants accumulate 43S-preinitiation and pre-60S-maturation complexes and alter paralog composition of ribosomal proteins in non-translating complexes. With few exceptions, e.g. RPL3B and RPL24C, these changes are not under transcriptional control. Our study suggests requirement of de novo synthesis of eukaryotic ribosomes for long-term cold acclimation, feedback control of NUC2 and eIF3C2 transcription and links new proteins, AT1G03250, AT5G60530, to plant ribosome biogenesis. We propose that Arabidopsis requires biosynthesis of specialized ribosomes for cold acclimation.