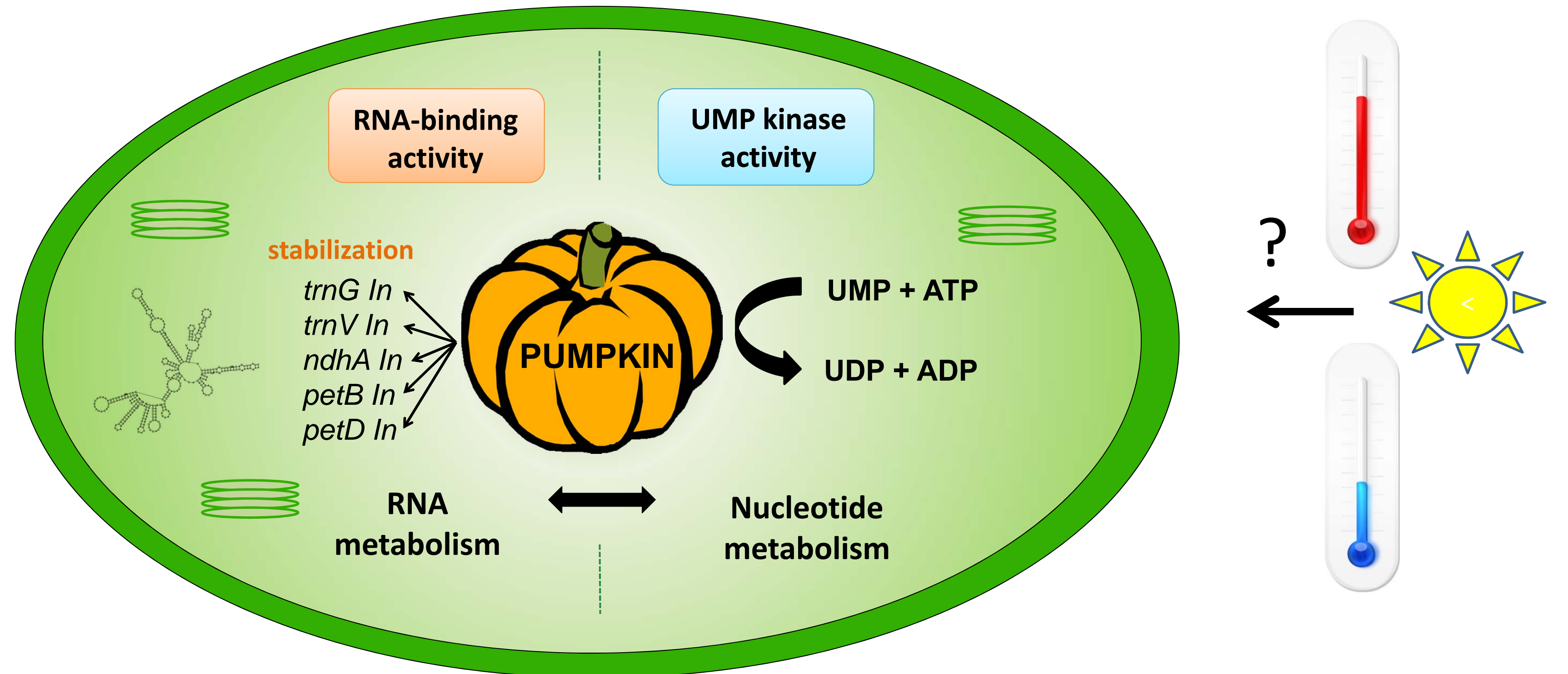


PUMPKIN – the sole Plastid UMP Kinase is involved in Chloroplast RNA Metabolism and Plant Acclimation

Lisa-Marie Schmid, Lisa Ohler, Torsten Möhlmann, Andreas Brachmann, Jose M. Muiño
Dario Leister, Nikolay Manavski* and Jörg Meurer*

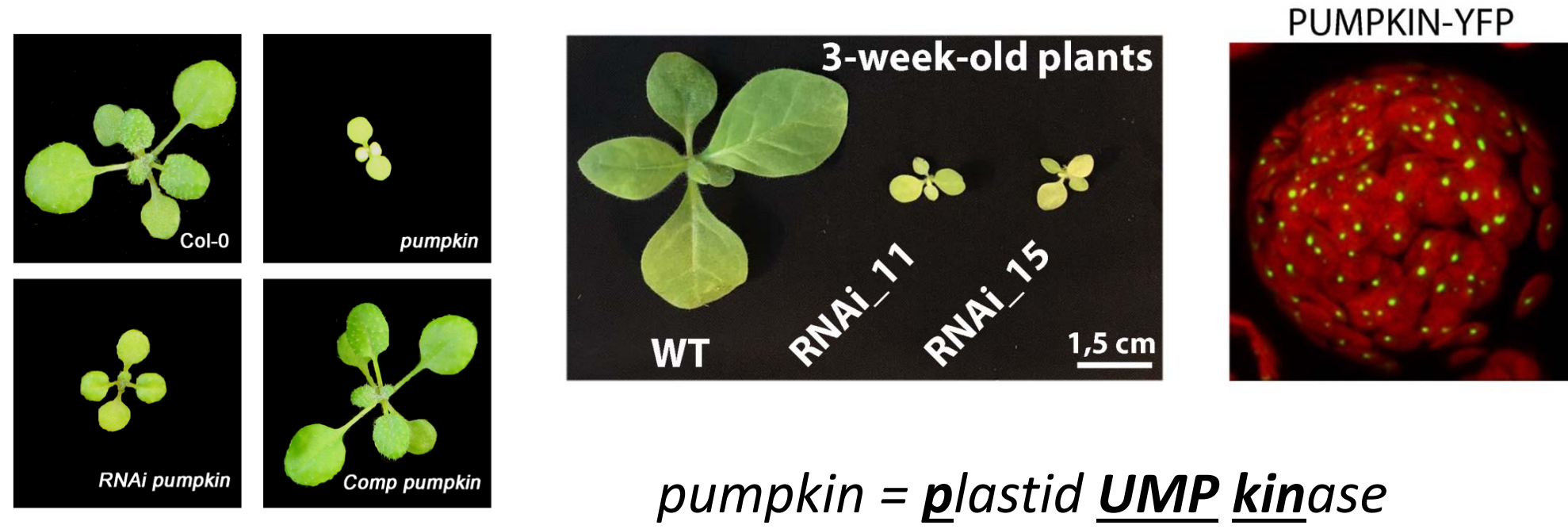
INTRODUCTION

The chloroplast displays a combination of eubacterial and eukaryotic features in terms of gene expression and **RNA metabolism**. After transcription, precursor transcripts are subjected to multiple processing steps including 5' and 3' end maturation, intercistronic cleavage, splicing and RNA editing. In these processes numerous **nuclear-encoded RNA-binding proteins** are involved. In this study, we present **PUMPKIN**, a functional **plastid UMP kinase** which is also involved in **chloroplast RNA metabolism** and its potential role in **plant acclimation**.

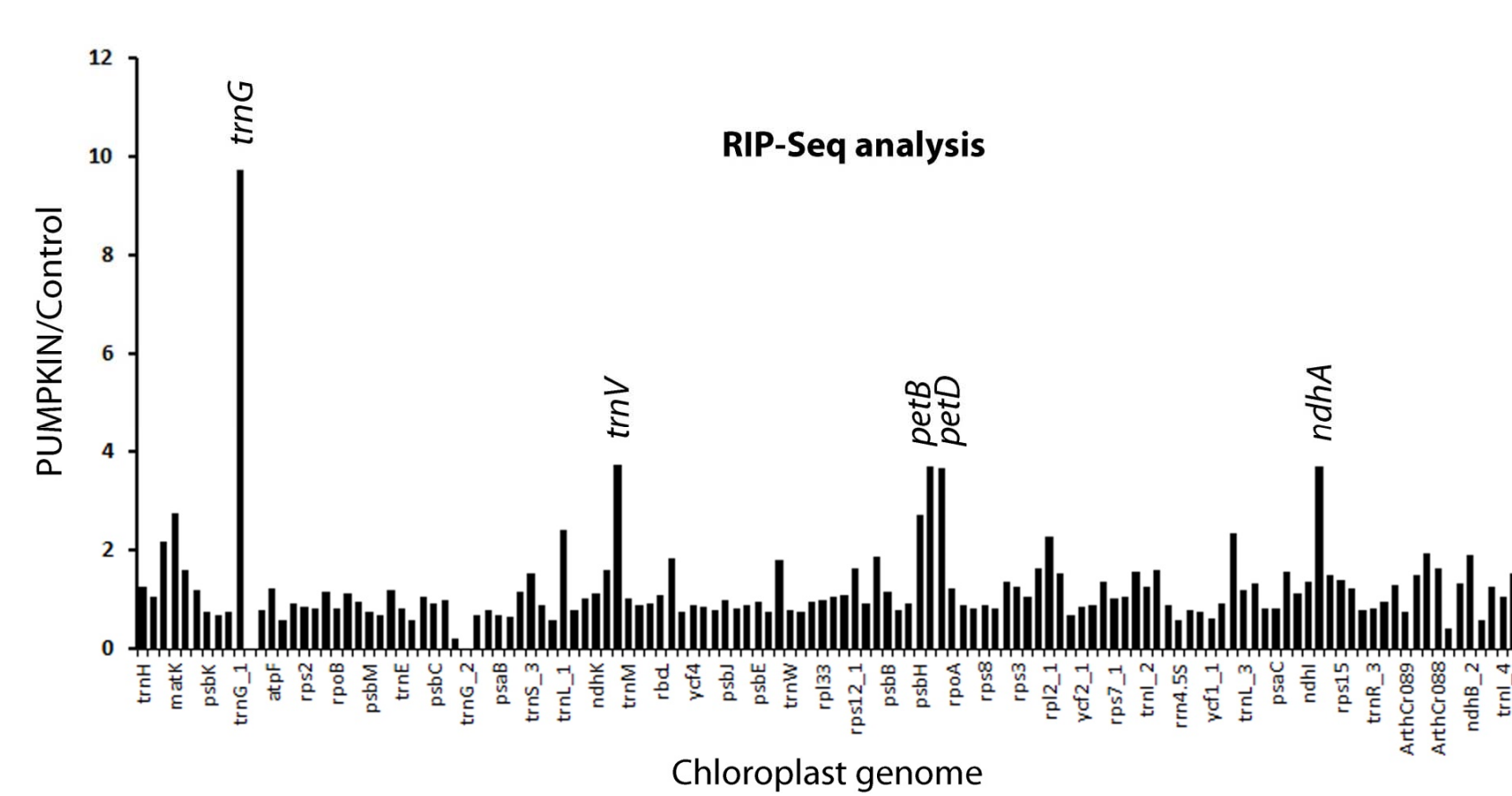


RESULTS

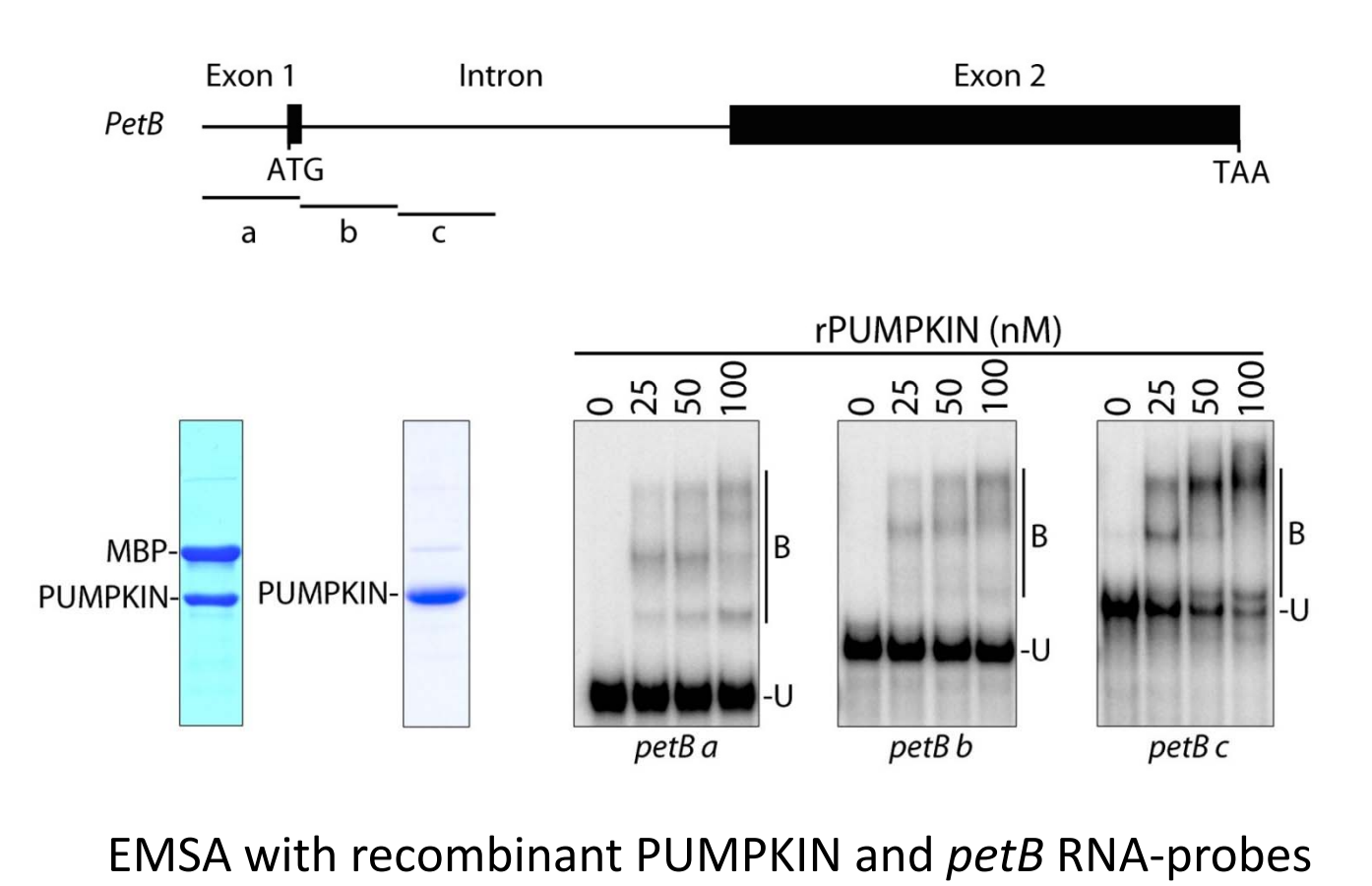
pumpkin knock-out mutants and RNAi lines appear pale-green and are retarded in development



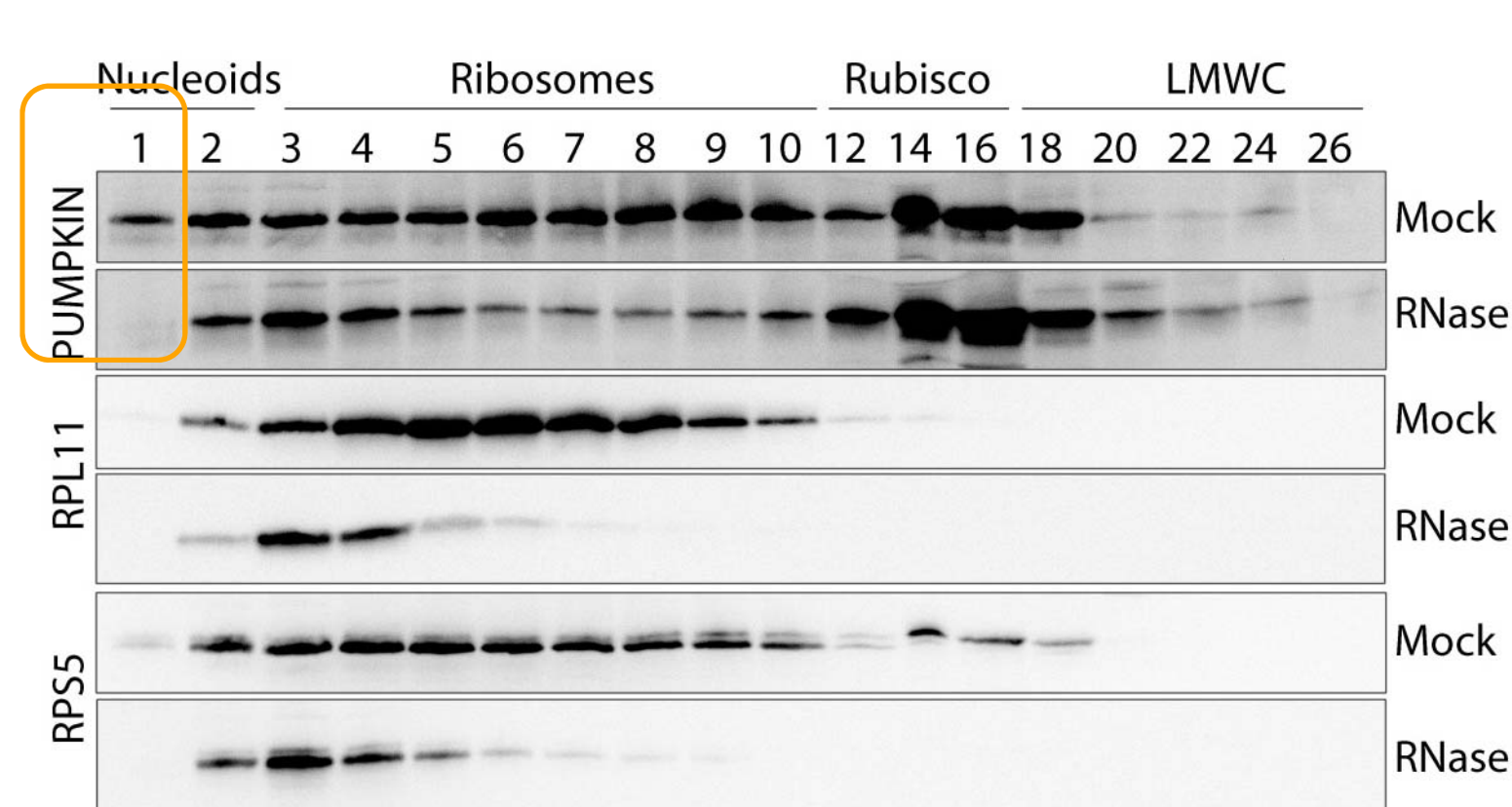
PUMPKIN associates with the intron regions of its RNA targets and affects their stabilization



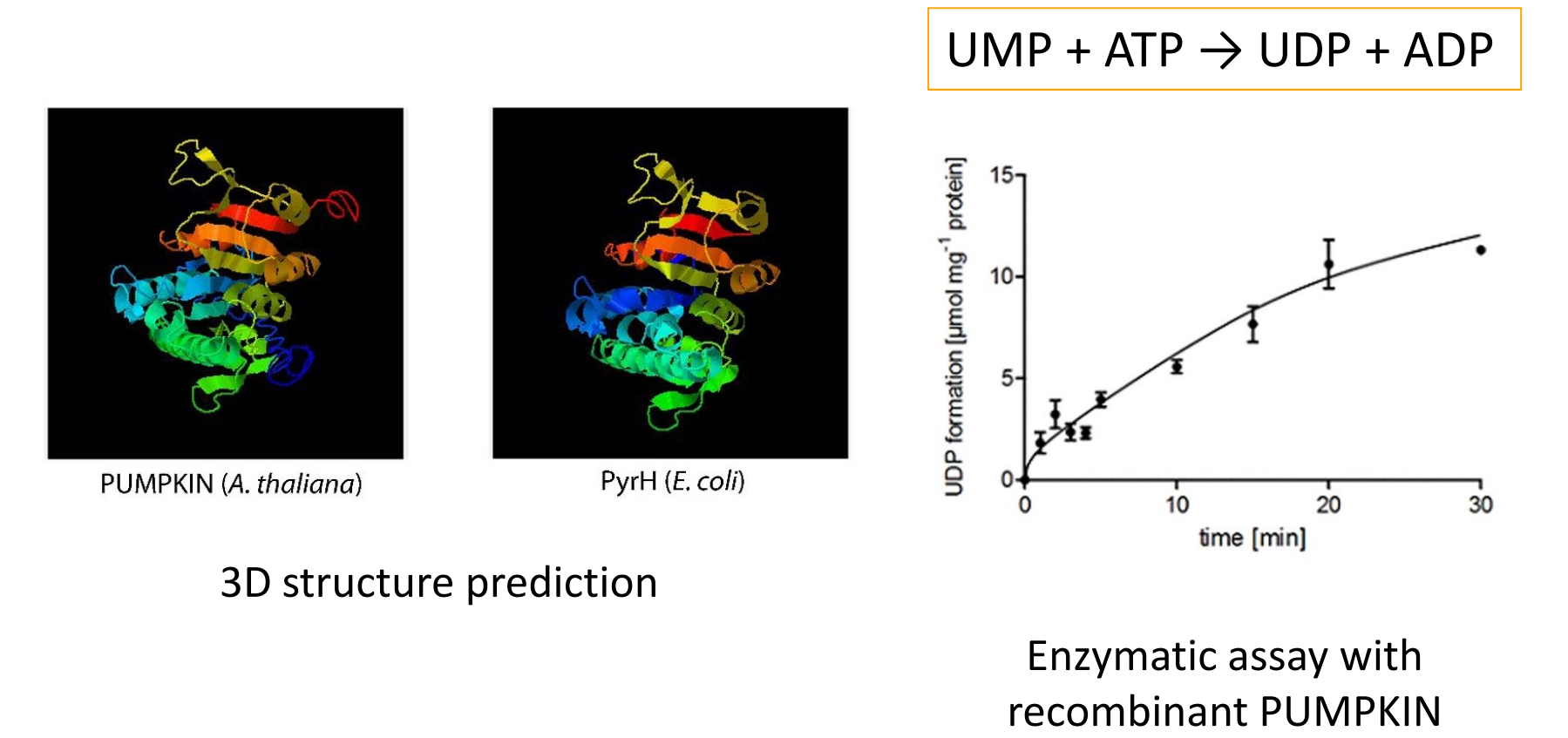
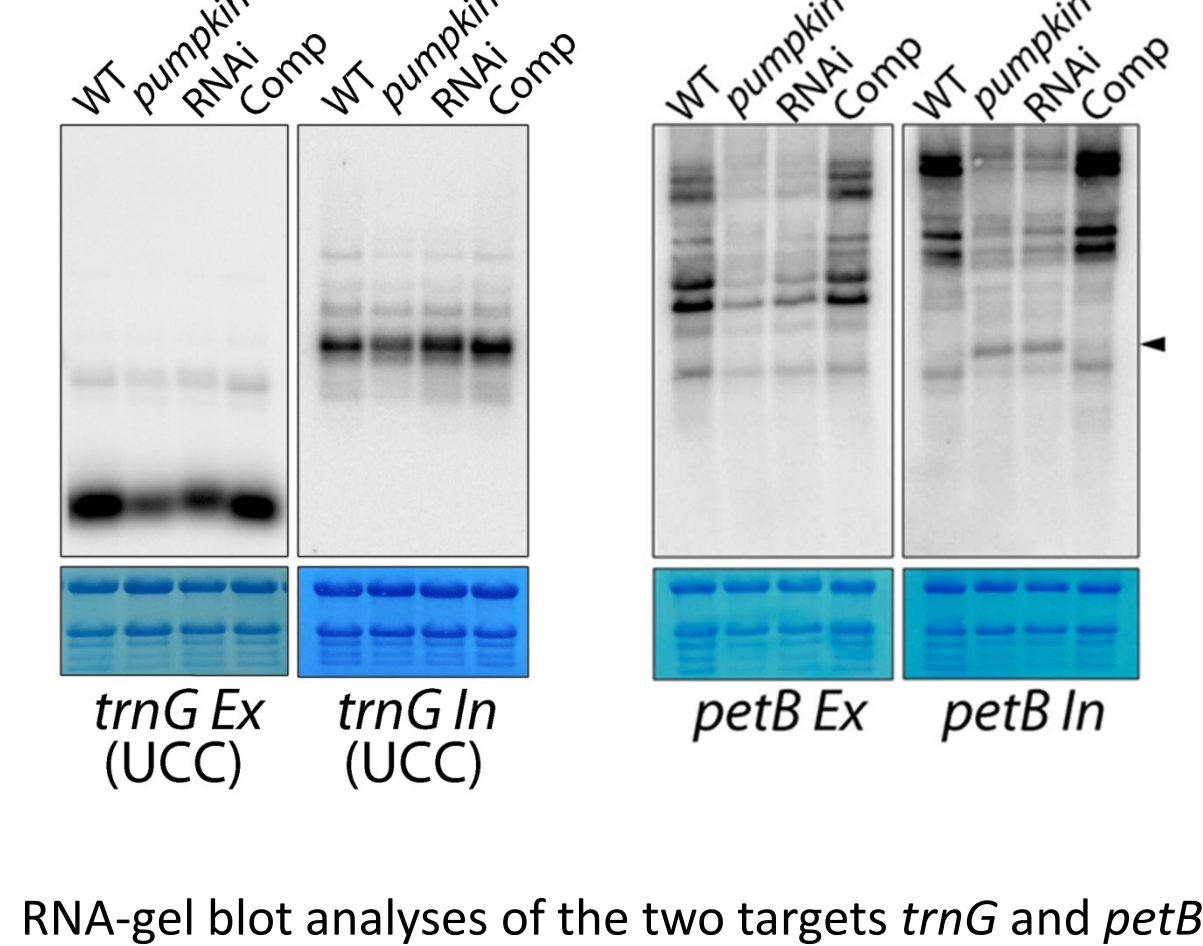
PUMPKIN binds to its target RNA with high affinity and specificity



PUMPKIN is localized in chloroplasts where it is associated with RNA in high molecular weight complexes

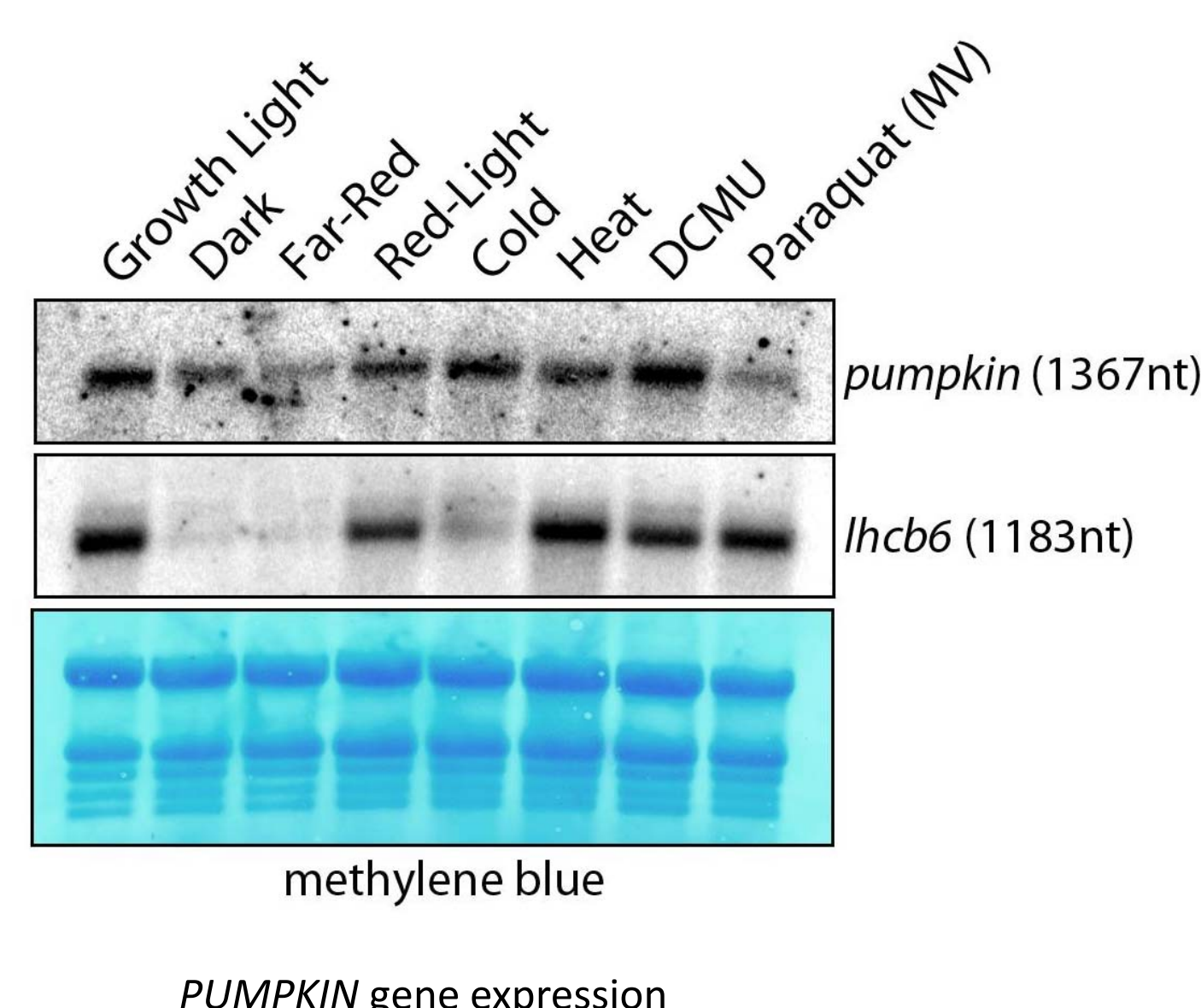
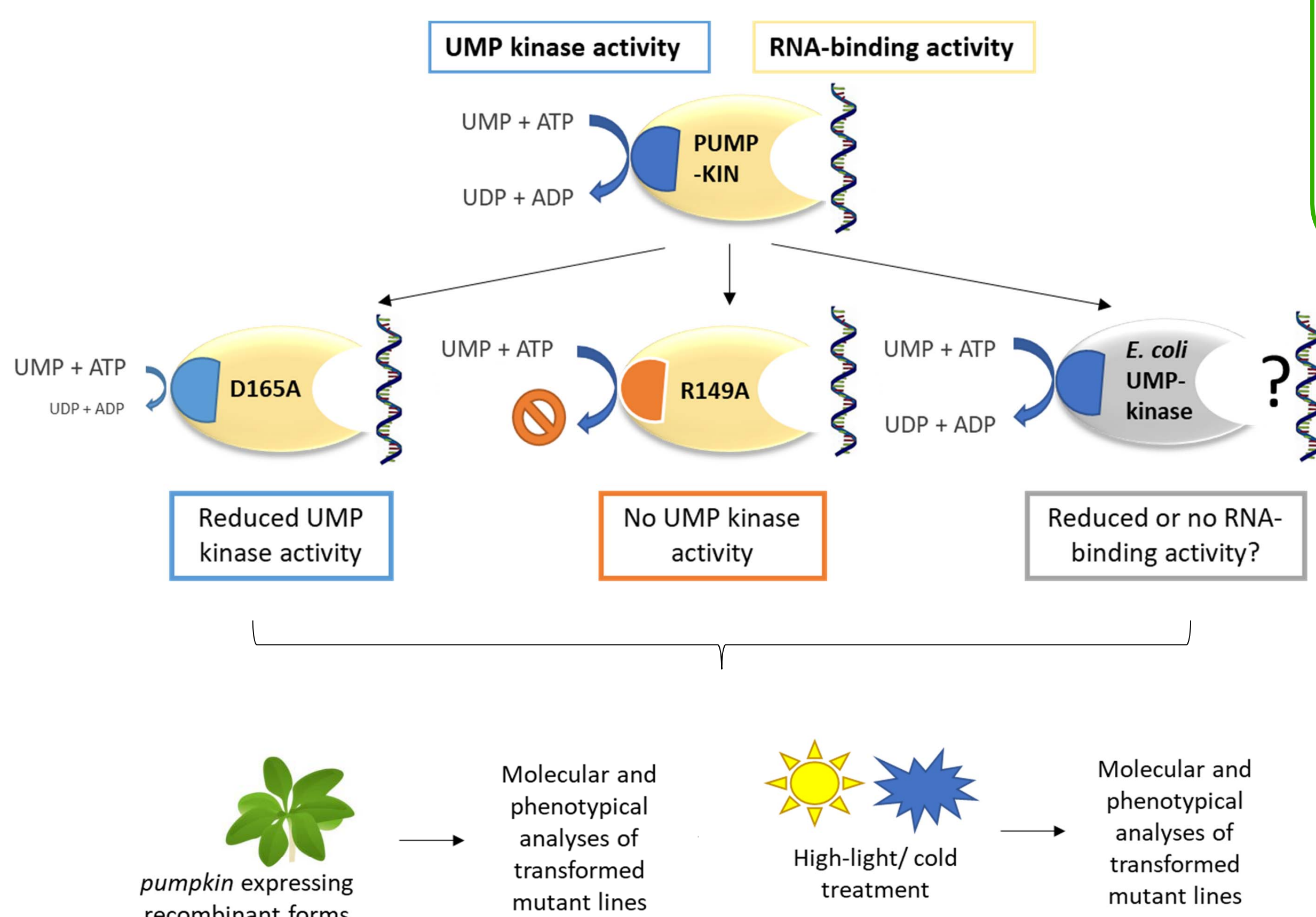


PUMPKIN is a functional UMP kinase and forms a homomultimer – similar to eubacterial UMPKs



PERSPECTIVES

The expression of *pumpkin* is highly responsive to different stimuli, pointing to a potential role of PUMPKIN in adopting the plants' needs to various conditions. Using **mutated versions of PUMPKIN** (D165A and R149A) with reduced or no UMPK activity as well as the *E. coli* homolog for complementation we want to decipher to which extent the two functions contribute to the resulting mutant phenotype and play a role under **various acclimation conditions**.



REFERENCES

- Schmid L-M, Ohler L, Möhlmann T, Brachmann A, Muiño JM, Leister D, Meurer J, Manavski N (2019) PUMPKIN, the sole Plastid UMP Kinase, Associates with Group II Introns and Alters Their Metabolism. *Plant Physiology*, 179: 248-264.
- Manavski N, Schmid, L-M, Meurer, J (2018) RNA-stabilization factors in chloroplasts of vascular plants. *Essays in Biochemistry*, 62: 51-64.
- Nagel R (2019) Moonlighting Enzymes: How Often Are We Missing Secondary Functions? *Plant Physiology* 179: 15-15