Structural Basis of DNA Binding by The NAC Transcription Factor ORE1, A Master Regulator of Plant Senescence

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Plants use sophisticated mechanisms of gene expression to control senescence in response to environmental stress or aging. ORE1 (Arabidopsis thaliana NAC092) is a master regulator of senescence that belongs to the plant-specific NAC transcription factor protein family.

ORE1 has been reported to bind to multiple DNA targets to orchestrate leaf senescence, yet the mechanistic basis for recognition of the cognate gene sequence remains unclear. Here, we report the crystal structure of the ORE1–NAC domain alone and its DNA-binding form.

The structure of DNA-bound ORE1–NAC revealed the molecular basis for nucleobase recognition and phosphate backbone interactions. We showthat local versatility in the DNA- binding site, in combination with domain flexibility of the ORE–NAC homodimer, is crucial for the maintenance of binding to intrinsically flexible DNA. Our results provide a platformfor understanding other plant-specific NAC protein–DNA interactions as well as insight into the structural basis of NAC regulators in plants of agronomic and scientific importance.