

Investigating the mechanism of a wheat CNL/MLKL pair that provides resistance to blast disease

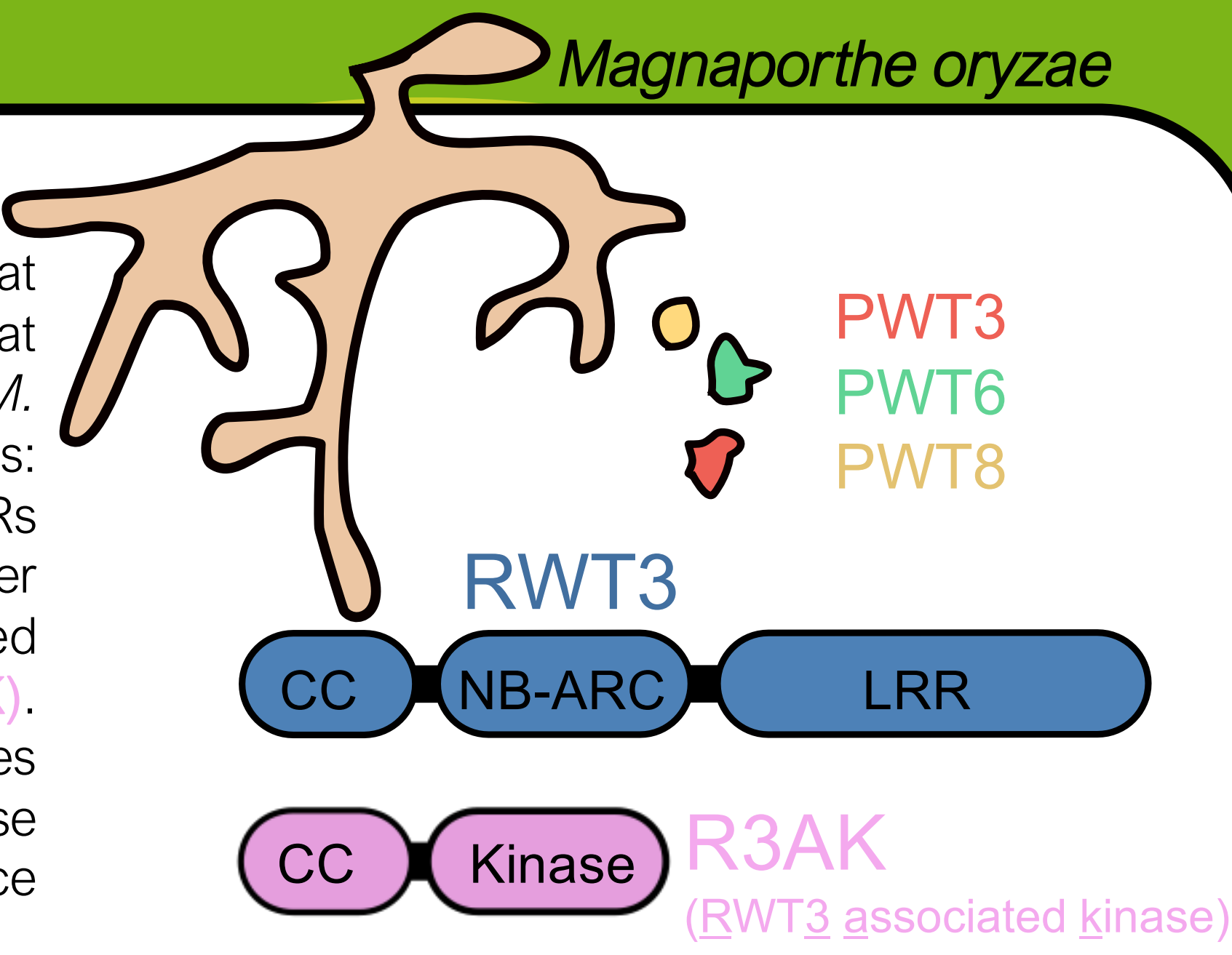
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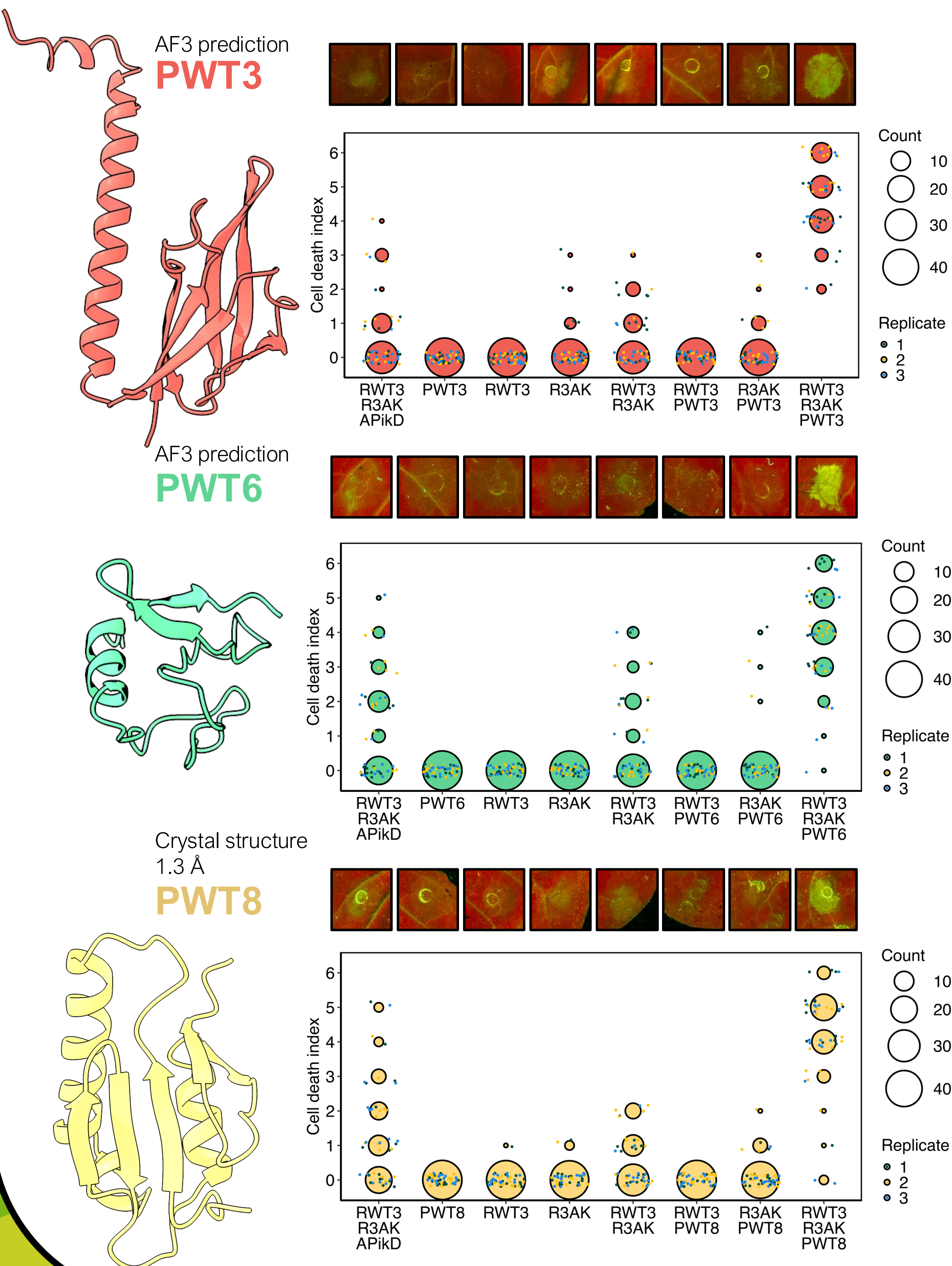
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Background:

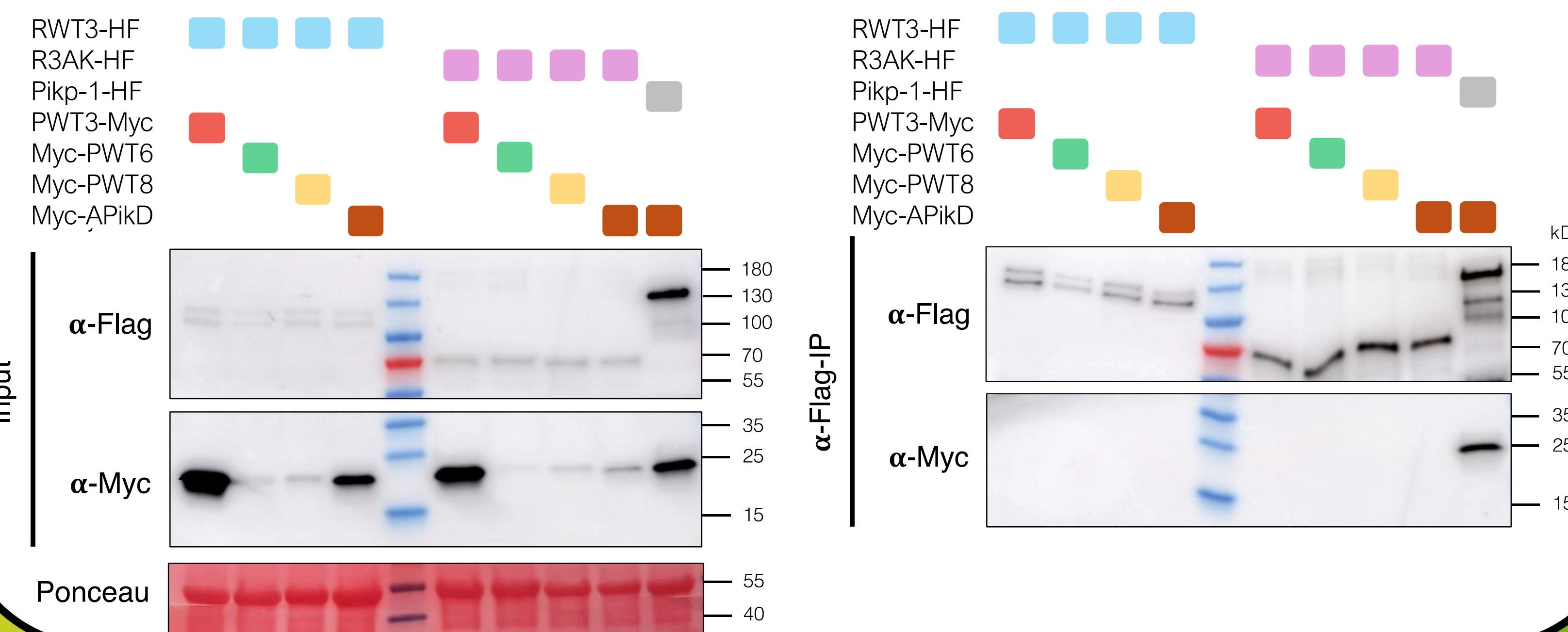
The CC-type nucleotide-binding, leucine-rich repeat (NLR) immune receptor, **RWT3**, is part of a wheat resistance locus that prevents successful infection of *M. oryzae* strains carrying any of three diverse effectors: **PWT3**, **PWT6** or **PWT8**. Unlike canonically paired NLRs (with one NLR to perceive effectors (sensor) and another to execute cell death (helper)), **RWT3** is genetically linked to an MLKL protein **RWT3 associated kinase (R3AK)**. MLKL (mixed lineage kinase like) domain architectures comprise an N-terminal coiled-coil (CC) fused to a kinase domain. Both **RWT3** and **R3AK** are required for resistance in wheat, establishing a novel immune receptor pairing.



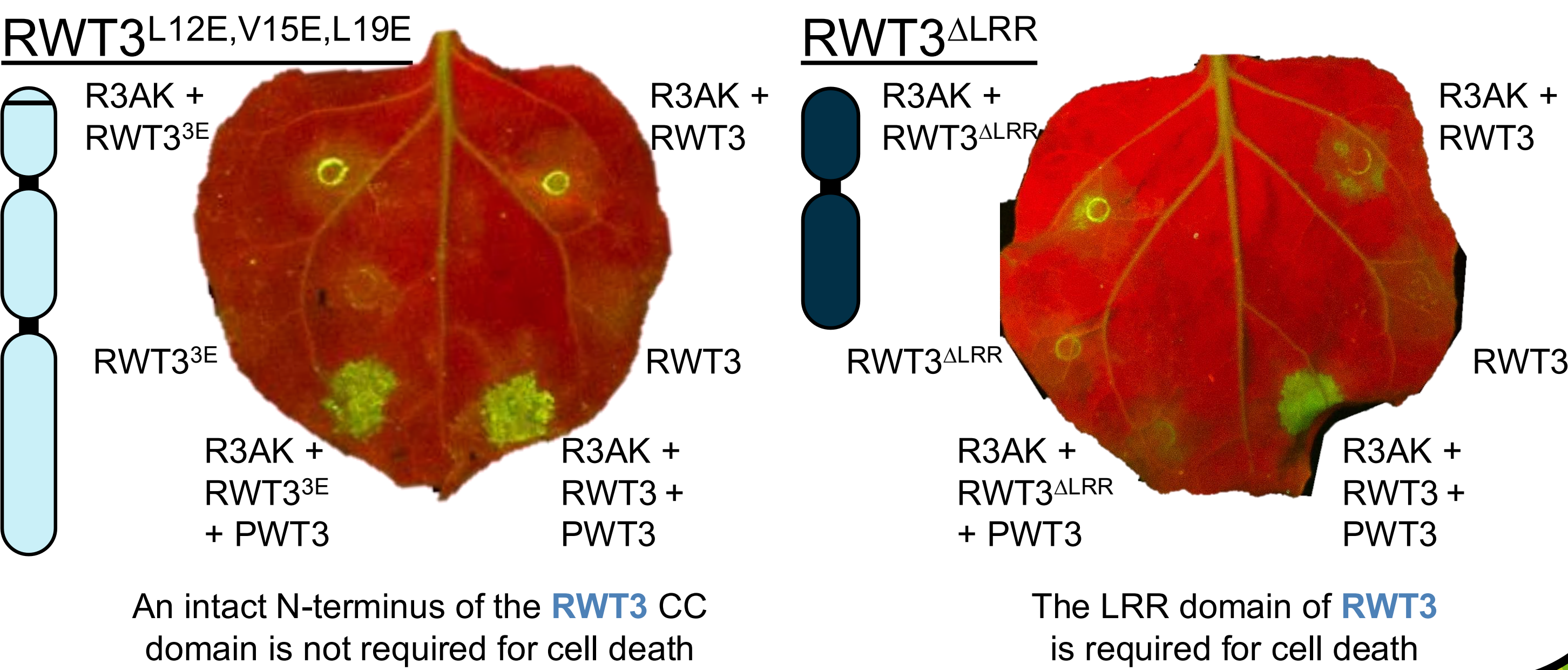
RWT3/R3AK are sufficient to cause cell death in *N. benthamiana* when co-expressed with three structurally diverse *Magnaporthe* effectors



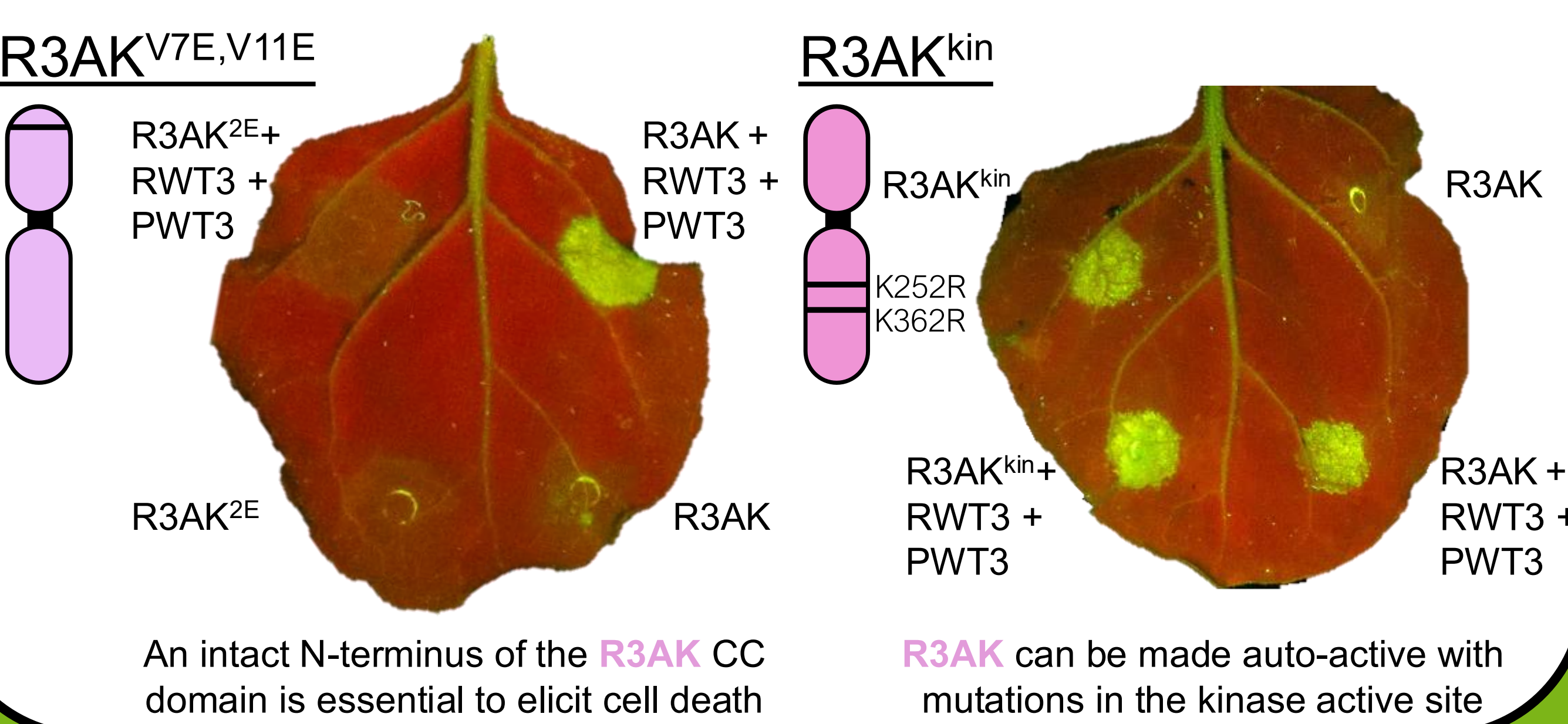
Neither **RWT3** or **R3AK** interact with **PWT3**, **PWT6** or **PWT8** in ColIPs



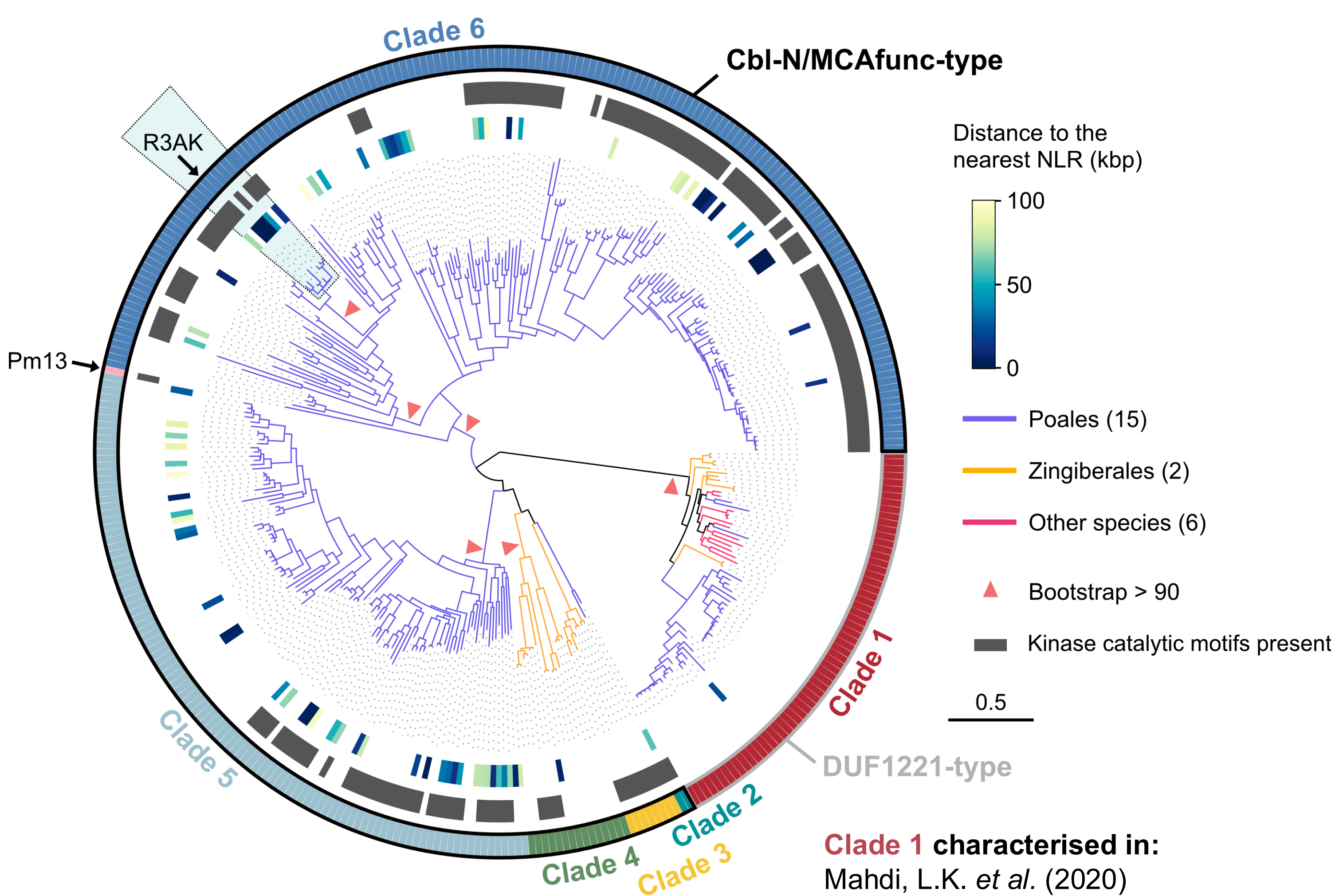
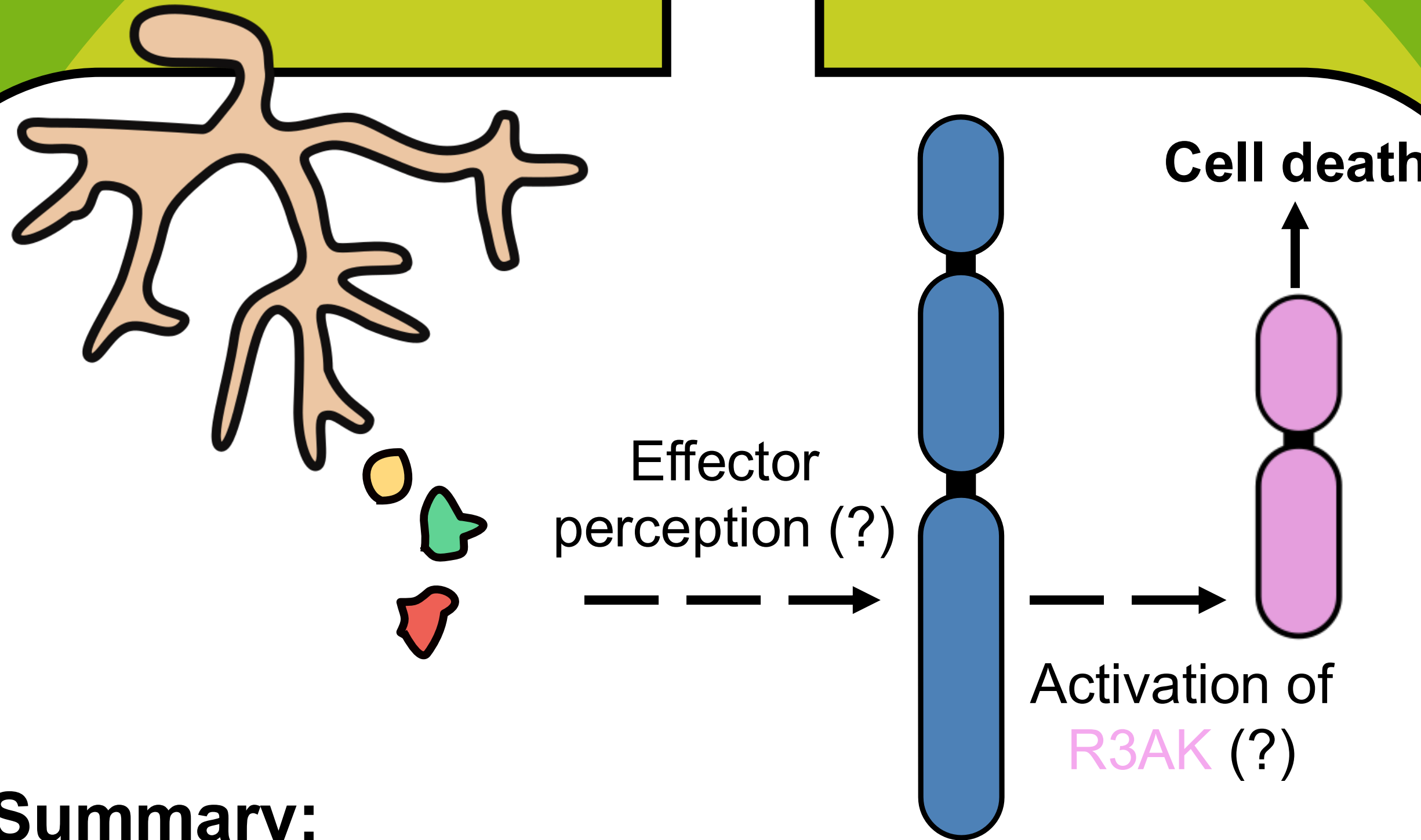
Mutational analysis shows that **RWT3** does not function as a typical helper NLR



R3AK acts as an elicitor of cell death



Future Resistance: MLKLs are often found genetically near NLRs in Poales



Summary:

We have demonstrated the CC domain of **R3AK** is required for effector triggered cell death and that **R3AK** can be made auto-active via mutating the kinase catalytic residues. **RWT3** is not actively involved in the execution of cell death, thus we hypothesise that **R3AK** acts as the helper in this paired system.

References:

1. Asuke, S. et al. (2021), <https://doi.org/10.1094/PHYTO-02-21-0080-R>.
2. Arora, S. et al. (2023), <https://doi.org/10.1038/s41477-023-01357-5>.