The MAP kinase substrate MKS1 is a regulator of plant defense responses

Arabidopsis MAP kinase 4 (MPK4) functions as a regulator of pathogen defense responses, because it is required for both repression of salicylic acid (SA)-dependent resistance and for activation of jasmonate (JA)-dependent defense gene expression. To understand MPK4 signaling mechanisms, we used yeast two-hybrid screening to identify the MPK4 substrate MKS1. Analyses of transgenic plants and genome-wide transcript profiling indicated that MKS1 is required for full SA-dependent resistance in mpk4 mutants, and that overexpression of MKS1 in wild-type plants is sufficient to activate SA-dependent resistance, but does not interfere with induction of a defense gene by JA. Further yeast two-hybrid screening revealed that MKS1 interacts with the WRKY transcription factors WRKY25 and WRKY33. WRKY25 and WRKY33 were shown to be in vitro substrates of MPK4, and a wrky33 knockout mutant was found to exhibit increased expression of the SA-related defense gene PR1. MKS1 may therefore contribute to MPK4-regulated defense activation by coupling the kinase to specific WRKY transcription factors.

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