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Functional analysis of MPK3 and MPK6, two mitogen-activated protine kinases in *Arabidopsis thaliana*

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Mitogen-activated protein kinase (MAPK) cascades are major pathways involved in the transduction of extracellular signals into intracellular responses. A MAPK cascade consists of three kinases; MAPK, MAPK kinase (MAPKK or MEK) and MAPKK kinase (MAPKKK or MEKK). MAPKKK is at the top of this three-tier cascade. Upon its activation by a receptor/sensor, MAPKKK phosphorylates MAPKK, which in turn phosphorylates MAPK and activates it. The activated MAPK can then phosphorylate other protein kinases or be translocated to the nucleus where it can phosphorylate transcription factors and activate gene expression. About 20 MAPKs were identified in the fully sequenced *Arabidopsis* genome. To study the function of MPK3 and MPK6, the two most closely related MAPKs in *Arabidopsis*, we isolated the corresponding T-DNA mutants from mutant libraries generated at Wisconsin *Arabidopsis* Knockout Facility and Salk Institute Genomic Analysis Laboratory. No morphological or developmental phenotypes were observed in the MPK3-/- and MPK6-/- single mutants. In order to determine if MPK3 and MPK6 have overlapping functions, we crossed the two single mutants (MPK3-/- and MPK6-/-) to generate double mutants. Among the 172 F2 plants that we genotyped, no double homozygous (MPK3-/-/MPK6-/-) mutant plants was identified, indicating that this genotype is lethal. We further observed that plants with the MPK3+/-/MPK6-/- genotype are a little smaller and sterile. Reciprocal back cross to wild type plants demonstrated that MPK3+/-/MPK6-/- plants are female sterile. The resilience of the pollens from such plants is still under investigation. In contrast to MPK3+/-/MPK6-/- plants, MPK3-/-/MPK6+/- plants are fertile and apparently normal. Together with the normal phenotype of MPK3-/- and MPK6-/- single mutants, we conclude that MPK3 and MPK6 perform overlapping but not identical roles in the reproduction and development of *Arabidopsis thaliana*.