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A novel calmodulin-binding protein (AtCBP54) is involved in pathogen resistance by inducing the accumulation of camalexin

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Calmodulin (CaM), a Ca^{2+} sensor in all eukaryotes, is known to be involved in the induction of defense responses in plants. However, the molecular targets of CaM are not well known.To elucidate the components in the CaM-mediated defense signal pathway, we screened an *Arabidopsis*expression library with a horseradish-peroxidase-conjugated CaM probe. This analysis revealed a CaM-binding protein containing a Toll/IL-1 receptor (TIR) homology domain that we denoted AtCBP54 (for *Arabidopsis thaliana* Calmodulin-Binding Protein 54kD). A Ca^{2+}-dependent CaM-binding domain (CaMBD) was identified in the C-terminal region of AtCBP54 by using the gel overlay assay. The ability of the CaMBD of AtCBP54 to bind specifically to CaM was confirmed by a gel mobility shift assay, a competition assay with a Ca^{2+}/CaM-dependent enzyme, site-directed mutagenesis, and a split-ubiquitin assay system. The gene expression of *AtCBP54* was strongly induced by exposure to bacterial pathogens (*Pseudomonas DC3000* strains). *AtCBP54*-overexpressing transgenic plants (AtCBP54OX) also showed enhanced resistance to bacterial pathogens. Interestingly, AtCBP54OX plants showed substantial accumumation of camalexin, a major phytoalexin in *Arabidopsis*. Furthermore AtCBP54OX plants showed the up-regulation of genes which are involved in the camalexin biosynthesis pathway. These results suggest that AtCBP54 may play an important role in the accumulation of phytoalexin, thereby resulting in plant disease resistance.

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