Soybean Calmodulin-binding Transcription Activator Acts as Negative Regulator of Drought Stress Response

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[Introduction]
The calmodulin-binding transcription activators (CAMTAs) mediate transcriptional regulation of development, growth, and responses to various environmental stresses in plants.

[Materials and Methods]
To investigate transcriptional expression of GmCAMTAs, total RNA was extracted and purified from soybean (Glycine max) plants using the trizol solution, according to the manufacturer’s instructions. The qRT-PCR analysis was performed using a SYBR kit, and the relative gene expression levels were automatically calculated using the CFX384 real-time PCR detection system. The expression of TUBULIN2 was used as the endogenous control. To test drought sensitivity, three-week-old plants grown in soil with sufficient water were not watered for 11 or 13 days. After re-watering, the recovery of the drought-treated plants was monitored. The drought experiments were repeated three times, using at least 12 plants from each line.

[Results and Discussion]
We identified and investigated roles of the 15 CAMTA homologous genes from soybean (Glycine max). The transcription of GmCAMTA genes exhibited distinct circadian regulation patterns under long-day conditions. The expression of GmCAMTAs were deferentially regulated in various organs and in response to various abiotic stresses, including drought, ABA, and NaCl. To investigate the biological functions of GmCAMTAs, we isolated GmCAMTA2, 8, and 11 cDNAs from soybean and overexpressed in Arabidopsis, respectively. Then, the phenotypes of these Arabidopsis transgenic plants were investigated under various abiotic stress conditions. Among them, 35S::GmCAMTA2-OX, 8-OX, 12-OX plants showed hypersensitivity to drought stress. These results suggested that GmCAMTA2 functions as a negative regulator in drought stress responses of soybean.

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