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# Overexpression of *TaLEA3* induces rapid stomatal closure under drought stress in *Phellodendron amurense* Rupr.

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## Abstract

Late embryogenesis abundant (LEA) proteins participate in drought stress responses in plants. In the present study, the gene *TaLEA3* from the drought-resistant plant *Tamarix androssowii* was transformed into Amur cork tree (*Phellodendron amurense*) via *Agrobacterium tumefaciens* to investigate the mechanism of stomatal closure in response to osmotic stress. Our results showed that *P. amurense* overexpressing *TaLEA3* were resistant to drought stress by rapid stomatal closure. To study the stomatal movement regulated at the molecular level, a model system for stoma closure was established in *in vitro* *P. amurense*. In this work, we found that the increased  $\text{Ca}^{2+}$  accumulation in guard cells of transgenic plants caused stomatal closure and activated  $\text{K}^{+}$  efflux under polyethylene glycol (PEG) stress. Moreover,  $\text{H}^{+}$  changes might provide a needed pH condition for stomatal closure. Further, nitric oxide (NO) fluorescence was measured using an NO-specific fluorescent probe, diaminofluorescein-FM diacetate, which showed that guard cell NO fluorescence was stronger in transgenic plants compared with wild type plants. Additionally, five genes encoding nitrate reductase were up-regulated, indicating that *TaLEA3* overexpression positively regulated NO biosynthesis and accumulation in the guard cells. This

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