

Enhancement of ABA receptor confers water-saving drought tolerance in wheat

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Drought stress causes to reduce crop production, and available water for agriculture is restricted in arid region. Therefore, drought tolerant and water-saving crops are required for stable food supply. Abscisic acid (ABA) contributes to drought tolerance in plants. Soluble PYR/PYL receptors, which belong to the START family protein, exist across higher plants. Thus, it is thought that PYR/PYL receptors can be a target gene to improve drought tolerance of plant. We generated transgenic wheat overexpressing wheat PYR/PYL (TaPYLox) and investigated drought tolerance and the other physiological traits. Seedlings of TaPYLox showed ABA hypersensitive phenotype. Transcriptome analysis revealed that many ABA responsive genes were induced in TaPYLox even under the well-watered condition, indicating that TaPYLox already possesses drought tolerant traits prior to drought stress. In addition, stomatal conductance and transpiration rate were decreased in TaPYLox. Water-use efficiency of TaPYLox calculated from the rate of photosynthesis and transpiration was improved compared with control plant. Moreover, biomass amount and seed yield produced from 1L of water significantly were increased in TaPYLox. Therefore, enhancement of ABA receptor expression contributes to not only drought tolerance but the “water-saving drought tolerance” phenotype, which can perform highly efficient CO₂ fixation under the limited water condition.