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- **Education Background:**

  2011 *D.S.C.* Nanjing Agricultural University, Nanjing, China;

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- **Working Experiences:**

  2018-present *Associate professor* of the College of Agronomy, Northwest A&F University;

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- **Research Interests:**

  Biosynthesis and regulation of wheat cuticular wax. Molecular biology.

- **Professional Activities:**

  Published articles as the first author or corresponding author in the Plant Physiology, Plant Journal, Journal of Experimental Botany, Plant and Cell Physiology, and Frontiers in Plant Science. As a reviewer of the Journal of Experimental Botany, Agriculture, Advances in Applied Physiology, and Frontiers in Microbiology.

Biosynthesis and drought resistance of cuticular wax alkanes in wheat

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Abstract: 【**Objective**】The aim of the work was to identify and functionally characterize a key alkane biosynthesis gene TaCER1-6A from wheat.【**Method**】Overexpression and CRISPR/Cas9-mediated gene editing of TaCER1-6A were carried out in wheat, and the wax content, cuticle permeability and drought tolerance of TaCER1-6A transgenic lines and wild-type (WT) were further analyzed by gas chromatography-mass spectrometry (GC-MS), gas chromatography-flame ionization detection (GC-FID), chlorophyll leaching, and water loss assays. The biological function of TaCER1-6A was characterized in detail. And dual-luciferase (LUC), yeast one-hybrid (Y1H), and β-glucuronidase (GUS) activation assays were used to confirm the interactions of R2R3-type MYB transcription factors TaMYB96-2D/5D and the promoter of TaCER1-6A.【**Result**】The CRISPR/Cas9-mediated knockout mutation in TaCER1-6A greatly reduced the contents of C27, C29, C31, and C33 alkanes in wheat leaves, while TaCER1-6A overexpression significantly increased the contents of C27, C29, C31, and C33 alkanes in wheat leaves, suggesting that TaCER1-6A is specifically involved in the biosynthesis of C27–C33 alkanes on wheat leaf surfaces. TaCER1-6A knockout lines exhibited increased cuticle permeability and reduced drought tolerance, whereas TaCER1-6A overexpression lines displayed reduced cuticle permeability and enhanced drought tolerance. TaCER1-6A was highly expressed in flag leaf blades and seedling leaf blades and could respond to abiotic stresses and abscisic acid (ABA). TaCER1-6A was located in the endoplasmic reticulum (ER), which is the subcellular compartment responsible for wax biosynthesis. A total of three haplotypes (HapI/II/III) of TaCER1-6A were identified in 43 wheat accessions, and HapI was the dominant haplotype (95%) in these wheat varieties. Additionally, we identified two R2R3-MYB transcription factors TaMYB96-2D and TaMYB96-5D that bound directly to the conserved motif (CAACCA) in promoters of the TaCER1-6A.【**Conclusion**】TaCER1-6A is required for C27–C33 alkanes biosynthesis and improves drought resistance in wheat, suggesting that TaCER1-6A is a promising tool aiming at generating wheat cultivars with more alkanes contents and improved drought tolerance via molecular breeding and transgenic strategies.

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