

Oil palm *EgCBF3* conferred stress tolerance in transgenic tomato plants through modulation of the ethylene signaling pathway

ABSTRACT

CBF/DREB1 is a group of transcription factors that are mainly involved in abiotic stress tolerance in plants. They belong to the AP2/ERF superfamily of plant-specific transcription factors. A gene encoding a new member of this group was isolated from ripening oil palm fruit and designated as *EgCBF3*. The oil palm fruit demonstrates the characteristics of a climacteric fruit like tomato, in which ethylene has a major impact on the ripening process. A transgenic approach was used for functional characterization of the *EgCBF3*, using tomato as the model plant. The effects of ectopic expression of *EgCBF3* were analyzed based on expression profiling of the ethylene biosynthesis-related genes, anti-freeze proteins (AFPs), abiotic stress tolerance and plant growth and development. The *EgCBF3* tomatoes demonstrated altered phenotypes compared to the wild type tomatoes. Delayed leaf senescence and flowering, increased chlorophyll content and abnormal flowering were the consequences of overexpression of *EgCBF3* in the transgenic tomatoes. The *EgCBF3* tomatoes demonstrated enhanced abiotic stress tolerance under *in vitro* conditions. Further, transcript levels of ethylene biosynthesis-related genes, including three *SIACSs* and two *SIACOs*, were altered in the transgenic plants' leaves and roots compared to that in the wild type tomato plant. Among the eight AFPs studied in the wounded leaves of the *EgCBF3* tomato plants, transcript levels of *SIOSM-L*, *SINP24*, *SIPR5L* and *SITSRF1* decreased, while expression of the other four, *SICHI3*, *SIPR1*, *SIPR-P2* and *SILAP2*, were up-regulated. These findings indicate the possible functions of *EgCBF3* in plant growth and development as a regulator of ethylene biosynthesis-related and AFP genes, and as a stimulator of abiotic stress tolerance.

Keyword: Oil palm; *EgCBF3*; AP2/ERF; Overexpression; Transgenic tomato; Ethylene