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 SlACSs and two SlACOs, 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 SlOSM-L, SlNP24, SlPR5L and SlTSRF1 decreased, while expression of the other four, SlCHI3, SlPR1, SlPR-P2 and SlLAP2, 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