Breaking-off tissue specific activity of the oil palm metallothionein-like gene promoter in T1 seedlings of tomato exposed to metal ions

ABSTRACT

Metallothioneins (MTs) are cysteine-rich metal-binding proteins that are involved in cell growth regulation, transportation of metal ions and detoxification of heavy metals. A mesocarp-specific metallothionein-like gene (MT3-A) promoter was isolated from the oil palm (Elaeis guineensis Jacq). A vector construct containing the MT3-A promoter fused to the ɓ-glucuronidase (GUS) gene in the pCAMBIA 1304 vector was produced and used in Agrobacterium-mediated transformation of tomato. Histochemical GUS assay of different tissues of transgenic tomato showed that the MT3-A promoter only drove GUS expression in the reproductive tissues and organs, including the anther, fruit and seed coat. Competitive RT-PCR and GUS fluorometric assay showed changes in the level of GUS mRNA and enzyme activity in the transgenic tomato (T0). No GUS mRNA was found in roots and leaves of transgenic tomato. In contrast, the leaves of transgenic tomato seedlings (T1) produced the highest GUS activity when treated with 150 εM Cu2+ compared to the control (without Cu2+). However, Zn2+ and Fe2+ treatments did not show GUS expression in the leaves of the transgenic tomato seedlings. Interestingly, the results showed a breaking-off tissue-specific activity of the oil palm MT3-A promoter in T1 seedlings of tomato when subjected to Cu2+ ions.

Keyword: Metallothionein gene promoter; Oil palm; Competitive RT-PCR; GUS fluorometric assay; Tomato