Conserved expression of a root-hair specific promoter \(\text{LeExt1.1}\) from \(\text{Lycopersicon esculentum}\) in cassava

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Introduction:

Using root hair specific promoter to target gene expression in trichoblasts has great potential to improve nutrient uptake and transformation from soil in cassava (\textit{Manihot esculenta} Crantz), a crop usually growing on acidic soils low in nutrients, particularly phosphorus. For example, when expressing a secretory phytase gene directed by a trichoblast-specific promoter \(\text{LeExt1.1}\) (Fig. 1) in potato, transgenic plants accumulated 40\% more P in leaves than wildtype plants\(^1\). The promoter \(\text{LeExt1.1}\) is isolated from tomato (\textit{Lycopersicon esculentum}) and directs the expression of an extensin-like protein \(\text{LeExt1}\) in its root hair\(^2\). Here we demonstrate the conserved expression of the promoter \(\text{LeExt1.1}\) in transgenic cassava and suggest that it can be used to target transgene expression in trichoblasts of cassava.

Materials and Methods:

1. Plasmid and \textit{Agrobacterium} strain: The \textit{A. tumefaciens} LBA4404 harboring the plasmid Bin\(\text{\Delta}\text{gen1.1GUS}\) was used for cassava transformation.

2. Cassava transformation: Plant transformation was conducted using the embryogenic suspension of TMS60444 via \textit{Agrobacterium}-mediated gene delivery\(^3\).

3. Molecular analysis of transgenic cassava plant lines: transgenic plants were confirmed by Southern analysis. The expression patterns of \(\text{LeExt1.1}\) were analyzed by Gus assay.

Results and Discussion:

1. Confirmation of transgenic cassava plant lines

![Fig. 3 Southern analysis of four transgenic lines by hybridizing with a GUS probe. Five ug of total genomic DNA was digested with Sac\(I\) to check the insertion number of transgene. M, molecular marker; P, plasmid \(\text{\Delta}\text{gen1.1GUS}\); Wt, wildtype control; A, G, J, P, different transgenic lines.]

2. Histochemical localization of GUS activity in cassava tissues

![Fig. 4 Histochemical localization of \(\text{LeExt1.1}\)-GUS activity in transgenic cassava. A, a primary root of an \textit{in vitro} plant. B-C, rhizodermis of primary roots. D, a longitudinal root section. E-G, a primary root of a greenhouse-grown plant and cross sections. H-I, induced root hairs and a cross section of the root. J, a Gus stained primary root showing the expression of GUS in the hairs of the differentiation zone.]

Conclusions:

The trichoplast-specific expression of \(\text{LeExt1.1}\) was confirmed in transgenic cassava plants. The promoter \(\text{LeExt1.1}\) can be used to target transgene expression in trichoblasts of cassava.

References: