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Development of Soil-Borne Disease Resistant Plants Expressing a Defensin Gene in Roots

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Objectives

The rationale of this research was the establishment of an environment-friendly protein expression system in plants. Expression of a transgene were regulated precisely using a tissue specific promoter, where the protection against pathogens was needed. In this way, transgenic plants will be safe to environment, especially to consumers.

Materials and Methods

1. Materials

Arabidopsis thaliana and *Nicotiana tabacum*

Agrobacterium tumefaciens GV 3101 carrying pBI121 or pBI121-PRP3

Fusarium oxysporum f. sp. niveum

2. Methods

In order to isolate the promoter region of a root-specifically expressed gene, a genomic fragment corresponding to *AtPRP3* cDNA was amplified by PCR in Arabidopsis. The promoter of *AtPRP3* was fused to GUS reporter gene or a pepper defensin geneand Arabidopsis and tobacco were transformed with the constructs. Then, its expression profiles were analyzed in transgenic plants to confirm the root-specific expression.

Results and Discussion

The *AtPRP3* promoter region was cloned from Arabidopsis to provide a root specific expression system. The promoter was employed to restrict the expression of the resistant gene in roots, which are very susceptible to various soil-borne pathogens. Then, an antifungal protein, defensin, was applied to model plants to elucidate disease-resistant effects against phyto-pathogens.

To elucidate the expression system, histochemical assay was conducted in transgenic Arabidopsis and tobacco. The control plants, driven by CaMV promoter, showed GUS activity in both shoots and roots. In contrast, only roots were stained in transgenic plants carrying the *AtPRP3* promoter. Expression of the defensin gene was observed in the transgenic plants by northern hybridization. The gene was expressed variably in shoots and roots of the control plants, but expressed only in roots of the transgenic plants carrying the *AtPRP3* promoter. Finally, the transgenic plants carrying the defensin gene were infected with a soil-borne fungus, *Fusarium oxysporum*. The development of disease symptoms was significantly delayed in the transgenic plants expressing the defensin gene.

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