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TRANSGENIC PLANTS IN RHIZOREMEDIATION OF PCB-CONTAMINATED SOIL

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Abstract

Polychlorinated biphenyls (PCBs) are organic compounds widely spread in the environment. Physico-chemical methods for decontamination of polluted soil are mostly expensive and destroy the landscape. In contrast, biological systems such plants, microorganisms and their consortia are public acceptable, mostly cheaper and don't destroy the landscape. Bacteria are able to degrade PCBs by anaerobic way (reductive dechlorination) and by aerobic degradation pathway (biphenyl operon). The role of plants in PCB decontamination is important as well. Plants absorb PCBs, transform them to non-phytotoxic form and store them e.g. in their vacuoles or cell walls. The cooperation between plants and microbe can be quite advantageous for PCB rhizoremediation. Plant exudates into the rhizosphere several compounds (e.g. glycosides, amino acids) stimulating the growth and activity of soil bacteria and compounds of their secondary metabolites (e.g. flavonoids, terpenoids, phenolic acids, etc.). Secondary metabolites can serve as a source of carbon and nitrogen. Because of their structural similarity with PCBs they are potential inducers of biphenyl operon encoding for enzymes involved in the bacterial biphenyl degradation pathway.

Preparation of transgenic plants with higher production of secondary metabolites with verified ability to induce bacterial degradation of PCBs could be the effective way of polluted soil decontamination.

The aim of this study is to prepare transgenic plants *Nicotiana tabacum* with overexpressed gene for flavonoid-3'-hydroxylase (*AtF3'H*), the enzyme converting kaempferol to plant secondary metabolite quercetin. The ability of quercetin to induce the expression of *bphA* gene, the gene of biphenyl operon, was verified by cultivation of PCB degraders with quercetin as a source of carbon and by detecting the *bphA* gene. Consequently the *AtF3'H* gene was cloned to the pQE30 vector to obtain the enzyme with histidine tail (6 x His) in bacteria. His tag will serve for the detection of expression and for the isolation of the obtained enzyme. After the activity test the *AtF3'H* gene with His tag will be cloned to the plant vector with the root specific promoter that will target the expression of AtF3'H in transgenic plants to roots. This should lead to a higher production of quercetin in plants and consequently to releasing of this compound to the rhizosphere, where this flavonoid can stimulate PCB degradation of present bacteria.

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