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GM PLANTS EXPRESSING BACTERIAL DIOXYGENASES FOR ENHANCED PHYTOREMEDIATION OF ORGANIC POLLUTANTS

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Abstract

Genetically modified (GM) plant can be useful for several reasons. One of them is cleaning up our environment, contaminated soil, water and air in the process called phytoremediation. The aim of this work is to construct and study GM plants with increased capabilities to degrade organic pollutants such as polychlorinated biphenyls (PCBs) and toluene.

We have prepared GM plants of *Nicotiana tabacum* containing genes of bacterial dioxygenases – *bphC* gene and *todC1C2* genes. *BphC* gene encodes 2,3-dihydroxybiphenyl-1,2-dioxygenase which cleaves the aromatic ring of dihydroxybiphenyl and was cloned in fusion with the gene for β-glucuronidase (*GUS*), luciferase (*LUC*) or with a histidine tail under the control of CaMV 35S promoter. The *todC1C2* genes produce oxygenase ISP_{TOL} (with histidine tail), a component of bacterial toluene-2,3-dioxygenase that can oxidize toluene and other organic pollutants (also biphenyl). Both genes (*todC1* and *todC2*) were cloned under either the constitutive CaMV 35S promoter or inducible RbcS promoter.

Several genetic constructs were designed and prepared and the possible expression of desired proteins in tobacco plants was studied by transient expression. Genetic constructs successfully expressing dioxygenase's genes were used for preparation of transgenic tobacco plants. The presence of transgenic DNA and its expression into mRNA and protein was already determined in parental and first filial generation of transgenic plants with *bphC* gene. The ability to remove the toxic substrate 2,3-dihydroxybiphenyl from media was studied with selected transgenic lines. Transgenic line H3 (harboring *bphC* gene with histidine tail) showed 95 % higher decrease of the substrate content in medium than nontransgenic plants. Further toxic effect of Delor 103 (PCB mix) and selected congeners of PCBs on transgenic tobacco lines was studied, where transgenic plants grew better than nontransgenic on Delor 103 and congener PCB 10. Properties of prepared transgenic plants will be studied more, nevertheless they already sound to be promising in phytoremediation technologies.

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