Tolerance to, and Uptake and Degradation of 2,4,6-Trinitrotoluene (TNT) are Enhanced by the Expression of a Bacterial Nitroreductase Gene in *Arabidopsis thaliana*

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Arabidopsis thaliana was transformed with a gene encoding a nitroreductase (NTR, E.C.1.6.99.7) with activity against a wide range of nitroaromatic compounds. The gene was transferred from *Escherichia coli* by an *Agrobacterium*-mediated *in planta* method. The obtained seeds were sowed to produce T1 plants, and they were assayed for the integration of the transgene in the plant genome. Transgenic plants that were positive with the PCR analysis were self-pollinated to produce T2 generation plants. Seven lines obtained were assayed for the NTR activity. While the non-transformed wild-type plants showed no detectable NTR activity, the enzyme activity of the transgenic plant lines was approx. 20 times higher. Using the line with the highest NTR activity, the phytoremediation characteristics of plants against 2,4,6-trinitrotoluene (TNT) was investigated. While the wild-type plants did not grow in the presence of 0.1 mM TNT, the transgenic plants grew almost normally in this condition. The uptake of TNT by seedlings of transgenic plants increased by 7 to 8 times when they were floated on TNT solution. HPLC analysis showed that the peak due to TNT taken up into plant body was much smaller in the transgenic plants as compared with that of the wild type, and that a number of peaks attributable to the degradation products of TNT, including 4-amino-2,6-dinitrotoluene, were detected in the extract from the transgenic plants. This indicates that the expression of bacterial NTR improved the capability of plants to degrade TNT.

Key words: Nitroreductase (TNT and NTR), Transgenic Plant, *Arabidopsis*, *nfsA*