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Applications of Genetic Transformation by Ri T-DNA From *Agrobacterium rhizogenes* in Plant Biotechnology

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Abstract

Agrobacterium rhizogenes genetically transforms the cells of dicotyledenous plants by introducing the Ri (root-inducing) T-DNA (transferred DNA) into the higher plant chromosome. Adventitious roots are produced at the site of inoculation which contain and express the Ri T-DNA. These roots have an unusual capacity to grow in axenic culture. They are capable of regenerating into whole plants, which transmit the Ri T-DNA to their progeny in a Mendelian fashion. Transformed roots and plants are phenotypicaly altered, providing a visual marker for the presence of Ri T-DNA.

The phenomenon of root induction has allowed us to develop a procedure for improving the rooting of cuttings of apple clones, whose natural ability to root is limited. The resulting plants are chimeric, with transformed root systems and normal aerial parts. This procedure thus produces genetic grafts, which allow one to selectively express a foreign gene in the root system. The capacity of transformed roots to grow in culture has led to several applications: secondary substances such as tropane alkaloids and root exudates can be produced under sterile conditions in fermentors, and rhizosphere microorganisms, such as *Polymyxa betae* can be cultured in association with transformed roots. The regulatory signals carried by Ri T-DNA encoded genes are candidates for chimeric gene constructs, in which the expression of a foreign gene is regulated in an organ specific and/or inducible manner.

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