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Genetic Transformation of Wheat

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1. Introduction

Genetic transformation of plants is a technique by which foreign DNA is introduced into plant cells, leading to regeneration of transgenic plants, with new features resulting from integration and expression of the foreign DNA. This technique has become an indispensable tool, both for plant biotechnologists to incorporate agronomically useful genes into crops, and for plant molecular biologists to test a particular structural gene or promoter in plant cells. Plant virologists use this technique to study the relationship between a viral pathogen and its host, and to introduce antiviral genes into plants to combat viral diseases.

Wheat (*Triticum aestivam* L.) is the world's largest crop in total production and area. However, despite persistent attempts by numerous laboratories over many years, a technique for successful wheat transformation was reported only very recently. The first transformed wheat plant was reported in 1992 ***(1,2)***; since then, three other groups have obtained fertile transgenic plants, independently ***(3–5)***. There are three common technical features in these reports. First, immature embryos were used as starting materials. This is because wheat immature embryo cultures give rise to a very large number of healthy regenerants within the shortest tissue-culture period. The regeneration is usually initiated from the scutellum tissue through formation of embryogenic callus and somatic embryogenesis. Second, microprojectile bombardment method was used as a means of DNA delivery. With this method, DNA was coated onto very fine heavy metal particles (ca. 1 μm in diameter), which were then accelerated at high speed by compressed helium gas or gunpowder cartridges toward plant cells. Such high-speed particles could penetrate the cell walls and deliver DNA into plant cells. Although such a way of delivering DNA into plant cells

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