Developing Transgenic Sugar Beet by Agrobacterium-mediated Gene Transfer

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Agrobacterium tumefaciens causes the neoplastic ‘Crown Gall Tumor’ disease on most plants. The bacterium infects plants at a wound site and transfers a piece of DNA to a plant cell. The transferred DNA gets integrated into the plant nuclear genome stably transforming the plant cell. This property of Agrobacterium is widely used for the generation of transgenic plants in plant biotechnology industry. However, Agrobacterium does not transform all plants with high efficiency. Sugar beet, a major crop plant in Minnesota, is one example. In previous research I found that the presence of extra copies of Agrobacterium virulence (vir) genes led to a large increase in tumor formation in red beet, a sugar beet relative. I identified one Agrobacterium strain with the smallest number of additional vir genes that efficiently transformed red beet. This strain was used to study transformation of sugar beet. Sugar beet seedlings were used for transformation. Seeds were germinated and grown until the cotyledons had fully expanded. The seedlings and excised cotyledons were infected with Agrobacterium carrying a kanamycin resistance selectable marker gene. After cocultivation with Agrobacterium, the infected tissue was placed on selective medium and the growth of kanamycin resistant callus tissue was monitored. The transformed callus was placed on shooting medium to produce transgenic plants.

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