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Commentary

Various Techniques Employed in Plant Genetic Engineering

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DESCRIPTION

Genetic Engineering (GE) is the alteration in the genome by transformation, manipulation, recombination of DNA. It refers to the strategies and ways developed for the targeted, specific variation of the inheritable information of living organisms. GE technologies have newly evolved as promising tools for enhancement of a wide range of organisms, including plants. The major advantage of GE is that, it enables a specific sequence on a chromosome be modified, thereby increasing the accuracy of the gene disturbance, correction or insertion, offering perfect reproducibility. Some of the advantages are:

- Increased production of the food
- Increased yield of plants
- Advanced taste of food and its nutritive values
- Further resistance to biotic and abiotic stress

Some of the techniques employed are:

Use of microbial vectors

One of the primary challenges in engineering plant genome is the choice of vectors that are modified in an organized manner to deliver reagents for GE. For a long time, plant viruses have been used as vectors for several purposes including the marketable product of useful proteins. The effective instrumentality and comprehensive genome structure makes viral genomes excellent choice to be used as vectors. Autonomously replicating toxin-grounded vectors supply other means to deliver GE reagents to plant cells. Among these are the RNA viruses, which for monocots include Wheat Streak Mosaic Virus (WSMV) and Barley Stripe Mosaic Virus (BSMV) and Tobacco Rattle Virus (TRV) for dicots. single-stranded (ss) DNA viruses, as Gemini viruses, have been also extensively acquired as vectors for distinctive crops. These viruses can be modified to carry heterologous coding. Recent developments in GE technologies have prompted scientists to incorporate viral vectors and use them for the effective delivery of GE reagents in plant cell.

Microprojectile bombardment

A microprojectile invassion or gene gun or biolistic molecule delivery system is used to deliver naked DNA into the plant by sticking it to a nanosized fragment. The approach has been tested in plants similar as rice, corn, and other cerealgrains. The nanosized molecules that act as a carrier to the DNA or RNA are moreover high-viscosity gold microparticles or high-viscosity tungsten microparticles. A helium pulse accelerates these pulses at similar high momentum that they penetrate the cell wall and membrane and enter into the cell. The gene gun isn't only used to change genomic DNA but can also make over organelles like as plastid and mitochondria. The approach is also used for *in vivo* and *in vitro* gene expression and regulation assay.

Electroporation

In this approach, plant cells growing in a culture medium are stripped off of their walls, forming protoplasts (plant cells without cell walls). Also, the wanted piece of DNA is supplied to the media and an electrical impulse is applied. This disturbs and destabilizes the plant protoplasts, ensuring in the entry of the DNA inside the cell.

The cells converted using the approach further attain or regenerate the walls and grown in completely grown plants in tissue culture. However, the use of this approach is limited because of the poor effectiveness of maximum plants to regenerate their cell walls.

Microinjection

Microinjection was introduced for injecting the large macromolecules into cells. The system was later acquired to insert DNA, RNA, enzymes, proteins, metabolites, ions and organelles into cells. Xenopus eggs and mammalian embryos have been used broadly in the development of microinjection ways due to their large size.

Microinjections generally constrain an flipped microscope wherein the objective lens is located below the stage and the light source is placed above. A micromanipulator precisely positions the injection needle near the tissue that has to be manipulated and is placed at 45-degree angle to the injection dish. Microinjection pipette uses capillary tips that are warmed up until the glass liquefies. This liquefied glass is further stretched to produce a very fine tip that measures around 0.5 millimeters in width.

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