

Soybean is a vital vegetable crop in China and Southeast Asia. Recently, the West has begun to recognize the culinary value and health benefits, including high protein content and the presence of omega-3 fatty acids, of soybean as well. This experiment centers on the stable incorporation of an Inositol Polyphosphatase 5-Phosphatase coding gene into genomic DNA of soybean. This gene is related to the plant's response to stress, such as drought or frost. Specifically, the gene product hydrolyzes soluble inositol phosphates. A substrate of this enzyme is InsP_3 which causes the plant to release Ca^{2+} from intracellular storage during drought stress, an unfavorable reaction (Perera, Hung and Moore).

The gene delivery method used is *Agrobacterium tumefaciens* mediated transformation. *A. tumefaciens* is a soil bacterium which infects plants in nature, causing crown gall disease, and the plant to produce opines which the bacterium catabolises. This is achieved through the stable incorporation of Transfer-DNA from a tumor-inducing plasmid into the plant's genome. For the purpose of this experiment, the wild-type T-DNA was replaced with a InsP-5-Ptase coding gene and a glufosinate resistance gene for selection of transformed cells.

Soybean seeds are wounded at the junction joining the hypocotyl and cotyledon in order to disrupt cell-cell signaling to encourage shoot growth, and to cause the plant cells to release acetosyringone. Acetosyringone is a phenolic compound which stimulates the *Agrobacterium* to begin T-DNA transfer. Once the T-DNA is incorporated into the plant genomic DNA, the cell in which it's expressed will be able to survive in the presence of glufosinate and have increased drought/frost tolerance. The goal of this experiment is to regenerate an entire soybean plant from one such transformed cell.

Bibliography

Perera, Imara Y., et al. "Transgenic Arabidopsis Plants Expressing the Type 1 Inositol 5-Phosphatase Exhibit Increased Drought Tolerance and Altered Abscisic Acid Signaling." The Plant Cell (2008): 2876–2893.

Zeng, Dr. Peiyu. "Soybean Transformation Procedure." November 2012.