

Activity 1.1.3 The Problem Solving Process 2017 ARD CI Kaltenbach

Part One:

Biotechnology - Dr. Marc Van Montagu, Dr. Mary-Dell-Chilton & Dr. Robert Fraley

Given

Problem: Increasing demands on food supply; adverse crop production factors such as disease, pests, & climate.

Proposed Solution: Genetic modification of plants to combat these factors

Protocol: Use bacterial plasmids **delivered using *Agrobacterium tumefaciens*** to transfer genetic material.

Data: Manipulation of plant genomes faster than traditional plant breeding. Improved yields through insect, disease, and herbicide resistance, and climate tolerance.

Communication: Implementation of Technology into other plants

Contributions to World Food Production:

Van Montagu: discerned the role *Agrobacterium tumefaciens* plays in causing crown gall in trees and the importance of the *Ti* plasmid.

Dell-Chilton: Worked out the method to 'reprogram' the *Ti* plasmid in order to disable 'bad' genes (like those that caused galls) or deliver genes of interest.

Fraley: Led team of researchers at Monsanto to use new techniques to astounding variations that have created plant marvels to feed the world.

Problem solving hurdles/processes:

Van Montagu: had to study a naturally occurring phenomena, and by process of elimination find the 'culprit'; namely *Agrobacterium tumefaciens*.

Then had to work out the 'how' of what *Agrobacterium tumefaciens* was doing requiring microscope, electron microscopes and world leading DNA work.

Dell-Chilton: Through years of painstaking do/undo/redo painstakingly work out how *Ti* worked, how to modify it, and what modifications did what eventually to the plant targets.

Fraley: Has worked for 30 years developing hundreds of improvements to plants that are now grown worldwide.