Genetic Transformation of Potato with a Triple R Gene Construct to Confer Resistance to Late Blight

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Abstract

The cultivated potato, *Solanum tuberosum* is affected by a variety of diseases with late blight (LB) caused by *Phytophthora infestans* being the most severe. The disease is mostly controlled by the application of large quantities of fungicides, which represent a financial burden on farmers in developing countries and pose risks to both human health and the environment. A more effective and environmentally friendly strategy to prevent damages caused by *P. infestans* is to use resistant potato cultivars.

In the early days of breeding for LB resistance, a small number of resistance (R) genes from the wild Mexican species, *Solanum demissum*, were introgressed into modern potato varieties. These genes conferred race-specific resistance, which was rapidly overcome by new isolates of the pathogen. Recently, a number of new R genes have been identified and cloned from several wild potato species .Taking advantage of genetic engineering, our strategy is to use three of these new R genes (*RB, Rpi-blb2* and *Rpi-vnt1.1*) in a triple gene construct, p CIP 99, based on the hypothesis that simultaneous mutation for pathogenicity against all three genes is unlikely, and therefore the resistance conferred by the construct should be durable. We plan to deploy the three stacked R genes into the potato variety "Victoria" (known in Kenya and Uganda as "Asante"). To date, we have produced more than 100 transgenic events which are currently being characterized. The pathogen population will be characterized concurrently to assess the expected durability of this resistance.

Key words: Potato, late blight resistance, R genes, genetic engineering