Deutscher Tropentag, October 11-13, 2005, Hohenheim

"The Global Food & Product Chain—
Dynamics, Innovations, Conflicts, Strategies"

Leaf Senescence-Inducible Expression of Isopentenyl Transferase in Cassava Rendering it Resistant to Drought Stress

Peng Zhang, Wilhelm Gruissem

Swiss Federal Institute of Technology (ETH), Institute of Plant Sciences, Switzerland

Abstract

It is well-know that cassava (*Manihot esculenta* Crantz) could stand prolonged abiotic stress and survives by shedding its leaves. Cytokinins exhibit antisenescence and drought resistance properties. Expression of the isopentenyl transferase (ipt) gene, which encodes a key enzyme for cytokinin biosynthesis, from *Agrobacterium tumefaciens* under control of the senescence-induced SAG12 promoter from Arabidopsis should lead to delayed cassava leaf senescence via an autoregulatory senescence inhibition system. We have transformed cassava plants with the ipt gene under control of the SAG12 promoter. The insertion of the SAG12-ipt cassette has been confirmed in seven cassava plant lines by Polymerase Chain Reaction (PCR) and Southern analyses. Five out of them could be detected low expressions of ipt in mature leaves by RT-PCR analysis. After dark-induced senescence treatment of mature leaves from both in vitro and greenhouse-grown plants, significant stay-greenness and repressed chlorophyll degradation were observed in the transgenic lines 529–28 and 529–48 compared to wild-type. The lines also displayed resistant to leaf senescence after drought treatment. Only 10 % leaves of 529–28 become senescent in comparison with 50 % of wild-type and 20 % of line 529–48 from 3 month old plants. The expression of ipt was increased in the old leaves of drought-treated 529–28 lines. During the development of transgenic plants, the decrease in chlorophyll, total protein, and Rubisco content in mature leaves was repressed. Interestingly, the transgenic plants also showed an early storage root bulking in comparison with wild-type plants. Evaluation of the yield of leaves and storage roots as well as drought resistance level will be field-trialed at CIAT, Colombia.

Keywords: Cassava, drought resistance, leaf retention, senescence-induced IPT expression

Contact Address: Peng Zhang, Swiss Federal Institute of Technology (ETH), Institute of Plant Sciences, Universitätstrasse 2 LFW E17, 8092 Zurich, Switzerland, e-mail: zhang.peng@ipw.biol.ethz.ch