Title A viral induced gene silencing approach to study galactose loss in cell walls during flower development and senescence

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Abstract

Substantial changes in primary cell wall composition and architecture occur in plant organs such as petals as they develop, mature and senesce. In petals of petunia 'Mitchell' (*Petunia axillaris x P. axillaris x P. hybrida*), galactose is the major non-cellulosic neutral sugar present in the primary cell wall polysaccharides. We have previously shown that its abundance doubles in floral buds during the 24 h period when flowers open before declining in petals as they mature and senesce. Changes in galactose levels are due to the activity of a family of β-galactosidases (EC 3.2.1.23) whose mRNA transcripts increase in abundance in floral buds during rapid bud expansion and in petals as they senesce. As a first step towards understanding galactose metabolism in petunia flower development and senescence, we identified 5 putative β-galactosidase gene family members in petunia petals. To assess their function in petunia flowers, approximately 120 bp fragments of the 5 β-galactosidases were linked in tandem into a hybrid DNA construct, inserted into the tobacco rattle virus (TRV) vector, and used to infect petunia plants. Five to six weeks after inoculation, petunia flowers showed up to 6-fold reduced total β-galactosidase activity, indicating that viral-induced gene silencing is a rapid and effective technology for silencing β-galactosidase expression in petunia flowers.