Title Physiological and molecular changes during opening and senescence of *Nicotiana mutabilis* flowers

Author Andrew J. Macnish, Cai-Zhong Jiang, Florence Negre-Zakharov and Michael S. Reid

Citation Plant Science, Volume 179, Issue 3, September 2010, Pages 267-272

Keywords Anthocyanin; Ethylene; Fragrance; Petal; *SAG12* (senescence-associated gene); Senescence

Abstract

As the flowers of *Nicotiana mutabilis* open and senesce, their petals show a striking color change from white through pink to red. This was associated with an increase in chalcone synthase (*CHS*) gene expression and a substantial rise in petal anthocyanin content. It was also accompanied by up-regulation of 1-aminocyclopropane-1-carboxylic acid oxidase (*ACO*) transcripts and elevated rates of ethylene production at the onset of petal wilting. Emission of the fragrant monoterpenoid volatiles 1,8-cineole, linalool, and terpineol also increased as petals developed pink coloration. The increase in volatile emission was preceded by a rise in monoterpene synthase (*MTS*) gene expression. Transcripts of a homologue of *SAG12*, a senescence-associated gene encoding a cysteine protease, began to accumulate in petals 3 days prior to visible wilting. Exposure of newly opened white flowers to 1 $\mu L\ L^{-1}$ ethylene accelerated petal coloration, wilting, and induction of *SAG12* expression by ca. 1 day while treatment with 500 $nL\ L^{-1}$ 1-methylcyclopropene (1-MCP), an inhibitor of ethylene action, retarded these processes. The numerous genetic and experimental tools available for tobacco can readily be applied to this close relative, which therefore provides an interesting new model for studying ethylene-mediated flower senescence.