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Tobacco TTG2 and ARF8 function concomitantly to control flower coloring by regulating anthocyanin synthesis genes

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Recently we elucidated that tobacco TTG2 cooperates with ARF8 to regulate the vegetative growth and seed production. Here we show that TTG2 and ARF8 control flower colorization by regulating the expression of ANS and DRF genes, which function in anthocyanin biosynthesis. Genetic modifications that substantially altered expression levels of the TTG2 gene and production quantities of the TTG2 protein were correlated with flower development and colorization. Degrees of flower colorization were increased by TTG2 overexpression but decreased by TTG2 silencing in coincidence with high and low concentrations of anthocyanins in flowers. Of five genes involved in the anthocyanin biosynthesis pathway, only ANS and DRF were TTG2 regulated and displayed enhancement and diminution of expression with TTG2 overexpression and silencing, respectively. The floral expression of ANS and DRF also needed a functional ARF8 gene as ANS and DRF expression was attenuated by ARF8 silencing, which concomitantly diminished the role of TTG2 in anthocyanin production. While ARF8 required TTG2 to be expressed by it and to regulate ANS and DRF expression, the concurrent presence of normally functional TTG2 and ARF8 was critical for the floral production of anthocyanin's and for flower colorization as well. Our data suggest that TTG2 cooperates with ARF8 to control degrees of flower colorization by regulating the expression of ANS and DRF, which are involved in the anthocyanin biosynthesis pathway. ARF8 depends on TTG2 to regulate the floral expression of ANS and DRF with the positive effects on anthocyanin production and flower colorization.

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