Genes of the Anthochlor Pathway are a Rich Source for Engineering Yellow Flower Coloration in Ornamentals

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Flower color is one of the most important traits to increase the quality and market value of ornamental plants. Anthochlor pigments (chalcones and aurones) contribute a bright yellow color for many flowers of the *Asteraceae* family. Two types can be synthesized by plants, the hydroxyl-type and the deoxy-type of anthochlor pigments. They differ in a lack of a hydroxyl group at the 6' position of the B-ring of chalcones or position 4 of the A-ring of the corresponding aurones, respectively. Whilst hydroxyl-chalcones are relatively unstable and quickly isomerize to colorless flavanones, deoxy-chalcones are more stable due to the lack of the hydroxyl group, enabling accumulation and subsequently can provide yellow flower coloration. Following processes may involve additional hydroxylation and/or ring closure, resulting in aurones. However, the individual contribution of the single enzymes involved in anthochlor biosynthesis remains unclear. There are two approaches for elucidating this blackbox: (a) creation of multigene constructs using the GoldenBraid system, each harboring different combinations or single genes encoding enzymes of the anthochlor pathway. These constructs will be expressed transiently and stably in model plants. Following this, analysis on the DNA- and protein level will be performed in order to examine potential differences in the phenotypes. Additionally, (b) CRISPR/Cas constructs will be designed in order to silence single genes encoding enzymes involved in the anthochlor biosynthesis and, corresponding to approach (a), evaluated.