Title Reduced petal pigmentation in Lisianthus cut flowers under low light conditions is mediated via decreased expression of anthocyanin biosynthesis genes

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Citation Abstracts Book, 6th International Postharvest symposium, 8-12 April 2009, Antalya, Turkey. 256 pages.

Keyword Pigmentation; Lisianthus; anthocyanin

Abstract

Cut flowers such as lupinus, delphinium, salvia, and snapdragon, bearing inflorescence with florets at various developmental stages, are harvested when the first floret or whorl opens. The younger florets in the inflorescence complete their development in the vase, but usually with reduced color. In many cases the last florets to be open remain almost colorless. Addition of sugar to the vase solution normally improves petal pigmentation, but still not to the level found in intact flowers developed outdoor. These indicate that pigment biosynthesis in petals is controlled by light intensity. The aim of this study was to explore the effects of low light intensity, typical for interior conditions as simulated in a standard observation room, on anthocyanin concentration and expression of anthocyanin biosynthetic genes in petals of cut Lisianthus (*Eustoma grandiflorum*) flowers. This flower offers a good model system, as its anthocyanin biosynthetic pathway and the effect of light on pigment accumulation in its petals were well documented, and the related anthocyanin biosynthetic genes were isolated and studied. Our data show that low light conditions resulted in reduced anthocyanin content in petals of developing florets both in cut flowers and potted plants. We have studied the expression of six genes leading to delphinidin (blue-violet color) biosynthesis in developing petals, including: chalcone synthase (CHS), chalcone isomerase (CHI), flavanone-3-hydroxylase (F3H), flavonoid-3',5' -hydroxylase (F3'5'H), dihydroflavonol-4-reductase (DFR) and anthocyanidin synthase (ANS). Although the various genes had different expression patterns during petal development, for all of them the expression was reduced in a similar manner under low light conditions. These results suggest that light intensity regulates a master transcription factor common factor all these anthocyanin biosynthesis genes.