The degradation of chloroplast components during postharvest senescence of broccoli florets is delayed by low-intensity visible light pulses

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Abstract

Senescence in harvested green organs, such as broccoli inflorescences, is a highly regulated process characterized by a massive degradation of chloroplast components. The dismantling of the chloroplast involves small "senescence-associated vacuoles" (SAVs) with high protease activity. The expression of the senescence associated gene, SAG12 (here BoSAG12), which encodes a senescence associated cysteine protease, correlated with SAVs appearance. One environmental factor that delays senescence is low-intensity visible light. Daily irradiation with pulses of 2 h of low-intensity white light (20–25 μmol m^{-2} s^{-1}) is a promising technology to delay postharvest senescence of broccoli stored at room temperature. The aim of this study was to analyze the effects of low-intensity white (W) and red (R) light treatments on some events related to chloroplast dismantling during postharvest senescence of broccoli inflorescences. We detected that chloroplasts number did not change during postharvest senescence. We found that SAVs participate in the dismantling of chloroplasts during the postharvest senescence of broccoli florets. SAVs appearance occurred earlier than visible yellowing. The two light treatments used, i.e. pulses of low-intensity W and R light, delayed chloroplast changes, including chlorophyll degradation and SAVs appearance. The delay of SAVs appearance was accompanied by the delay of *BoSAG12* induction in broccoli florets. Regarding protein degradation, not all proteins analyzed were affected equally. The light treatments had greater effect on the retention of thylakoid proteins than on Rubisco and apparently, the effects of light treatment were higher on proteins from PSII (LHCII) than on those from PSI (LHCI and PsaA).