

Postharvest temperature and light treatments induce anthocyanin accumulation in peel of ‘Akihime’ plum (*Prunus salicina* Lindl.) via transcription factor PsMYB10.1

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Abstract

Anthocyanin accumulation is responsible for red pigmentation in plum peel and affected by light and temperature. We investigated the effects of temperature and LED light (400–800 nm, with following red: green: blue ratio 20.9: 75.7: 3.4 respectively) with total radiant flux adjusted at 150 mol m⁻² s⁻¹ on anthocyanin accumulation in postharvest ‘Akihime’ plum peel and found that 20 °C/light could induce anthocyanin concentration and therefore improve red coloration. However, no significant anthocyanin accumulation was detected in the peel of plums treated with 30 °C or under dark conditions. RNA-Seq and qRT-PCR analysis showed that the transcript levels of anthocyanin accumulation-related genes, including *phenylalanine ammonialyase* (*PAL*), *cinnamate-4-hydroxylase* (*C4H*), *4-coumaroyl:CoA-ligase* (*4CL*), *chalcone synthase* (*CHS*), *chalcone isomerase* (*CHI*), *flavanone 3-hydroxylase* (*F3H*), *dihydroflavonol 4-reductase* (*DFR*), *anthocyanidin synthase* (*ANS*), *UDP-glucose: flavonoid 3-O-glucosyltransferase* (*UFGT*) and *glutathione S-transferase* (*GST*) in the peel were upregulated by 20 °C/light treatment. Transcription factors differentially regulated by temperature and light were identified. A homolog of peach anthocyanin MYB activator, namely *PsMYB10.1*, was lowly expressed in the peel of unpigmented fruit but significantly upregulated by 20 °C/light treatment. The function of *PsMYB10.1* was verified by transient overexpression in *Nicotiana tabacum* leaves, resulting in strong anthocyanin accumulation when co-infiltrated with *PsbHLH3*. Dual luciferase assays further showed that *PsMYB10.1* activated the promoters of the anthocyanin biosynthetic genes *PsANS*, *PsUFGT* and *PsGST*. These results suggest that appropriate temperature and light regimes at postharvest can induce anthocyanin accumulation in the peel of ‘Akihime’ plum by activating the expression of the positive regulator *PsMYB10.1* and consequently the genes involved in biosynthesis and transportation of anthocyanin.