

Wounding and UVB light synergistically induce the postharvest biosynthesis of indicaxanthin and betanin in red prickly pears

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Abstract

Indicaxanthin and betanin, the main betalains in red prickly pear (*Opuntia ficus-indica* cv. Rojo vigor), possess important applications as colorants and health-promoting biomolecules. Therefore, it is relevant to explore treatments that induce their postharvest biosynthesis in the fruit. In this study, the effect of ultraviolet B (UVB) radiation and wounding on the biosynthesis of indicaxanthin and betanin in red prickly pear was evaluated. Whole and wounded-fruit (cut in four even pieces with a cross and a longitudinal section) were UVB radiated (6.4 W m^{-2}) for 15 min, and stored for 24 h at 16 °C. UVB radiation applied in the whole tissue induced an immediate accumulation of indicaxanthin after treatment, obtaining increases of 325.8% and 106.5% in the pulp and peel, respectively. The application of UVB radiation and wounding before storage induced a synergistic effect on the accumulation of indicaxanthin in the pulp (447.0%) and betanin in the peel (315.0%) after storage. Tyrosine hydroxylase and l-dopa oxidase activities of tyrosinase, as well as the spontaneous formation of Cyclo-dopa, which are key steps on betalain biosynthesis, were also synergistically activated by wounding and UVB light. Results allowed the generation of a physiological model explaining the synergistic effect of wounding and UVB on the postharvest biosynthesis of indicaxanthin and betanin in red prickly pear.