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High PAR and UV-B radiation-induced differential responses in green and white leaf sectors of *Pelargonium zonale* in relation to sugar, antioxidative and phenolic metabolism

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In this study we investigated the specific effects of high photosynthetically active radiation (PAR) and ecologically relevant UV-B radiation (0.90 W m^{-2}) on antioxidative, phenolic and sugar metabolism in variegated *Pelargonium zonale* plants. The green-white leaf variegation in these plants presents a suitable model system for examining "source-sink" interactions within the same leaf. High PAR (1350 µmol m^{-2} s^{-1}) and UV-B radiation induced tissue specific responses in variegated *P. zonale* leaves. While UV-B radiation had a pronounced effect on phenolic content in the white tissue, high PAR intensity stimulated accumulation of phenylpropanoids and flavonoids with preferential antioxidative *vs.* UV-screening function in green tissue. High PAR stimulated the increase of antioxidative metabolism in both leaf sections. However, the greater enhancement of ascorbate peroxidase and catalase activities and ascorbate content under HL+UV-B than HL only in green sectors, indicated that UV-B radiation and high PAR synergistically stimulated antioxidative defense. These results indicate that green tissue can be considered as high light acclimated, provided with an efficient defense against potential oxidative pressure under high PAR, along with significant protective role of UV-B radiation. Efficient sugar transport from green to white tissue was stimulated by both UV-B radiation and high PAR intensity. By stimulation of starch and sucrose breakdown and carbon allocation in the form of soluble sugars from "source" (green) tissue to "sink" (white) tissue, UV-B radiation stimulates a compensatory mechanism for phenylpropanoid and flavonoid biosynthesis in white tissue, due to the lack of photosynthesis.

Keywords: high light intensity, flavonoids, sugar distribution, UV-B radiation, variegated *Pelargonium zonale*