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Differential regulation of glutamine synthetase and glutamate synthase genes by plant growth regulators in *Arabidopsis*

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The glutamine synthetase (GS) – glutamate synthase (GOGAT) cycle is responsible for primary and secondary ammonium assimilation in plants. In the *Arabidopsis* genome there are five genes encoding cytoplasmic GS1 isoforms (*GLN1;1-1;5*), one gene encoding chloroplastic GS2 isoform (*GLN2*), two genes encoding ferredoxin-dependent GOGAT isoforms (*GLU1* and *GLU2*), and one gene encoding NADH-dependent GOGAT isoform (*GLT1*). These genes are distinctly regulated during plant development and respond differently to environmental cues to ensure plasticity in the plants responses to changes in nitrogen availability, light and metabolic state of the cell. In this work we investigated the expression of GS and GOGAT genes in *Arabidopsis* plants treated with different concentrations of plant growth regulators: kinetin, abscisic acid, gibberellic acid and 2,4-dichlorophenoxyacetic acid. Four week old plants grown in liquid culture were treated for 24h with these growth regulators and the expression of GS and GOGAT genes in roots and shoots was measured by qPCR with absolute quantification. The results show that plant growth regulators differentially regulate the expression of GS and GOGAT genes. In many instances, the observed patterns of GS and GOGAT gene expression in plants treated with different growth regulators provides insights into the hormonal regulation of these genes during development and as response to changes in nitrogen and light availability.

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Combined effect of UV-B irradiation with high or low light on photosynthesis in variegated plant species

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High doses of UV-B irradiation (290-315 nm) solely, or combined with high light intensity, can lead to direct ROS production ($^{\bullet}OH$, $O_2^{\bullet-}$) and oxidative stress in the leaves. However, lower UV-B doses supplementing visible light can participate in acclimatory responses through induction of antioxidative defence and phenolics metabolism or by signal transduction processes possibly mediated by low ROS concentrations. Plants differentially respond to UV-B supplemented with high or low photosynthetically active radiation (PAR). Whether it is solely an effect of UV-B irradiation on the leaf metabolism or a consequence of the combined light effect may be resolved using variegated foliage plants as a model system. The sun simulators at Helmholtz Zentrum Munich allow simulation of sun irradiance for the both spectral quality and spectral quantity including the same ratio UVB:UVA:PAR, without steep transitions of temperature, light and relative humidity. Therefore, we have studied the response of *Pelargonium zonale variegatum* and *Plectranthus coleoides* plants for 9 days: (1) at high PAR (HL - 1300 µmol m^{-2} s^{-1}); (2) at low PAR (LL - 300 µmol m^{-2} s^{-1}) both with supplemental UV-B radiation (0.6 $W.m^{-2}$). Composition of photosynthetic pigments and phenolic compounds and the most important fluorescence pa-