Light spectra trigger divergent gene expression in barley cultivars

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Abstract

Light spectra influence barley development, causing a diverse range of responses among cultivars that are poorly understood. Here, we exposed three barley genotypes with different light sensitivities to two light sources: fluorescent bulbs, over-representing green and red wavebands, and metal halide lamps, with a more balanced spectrum. We used RNA sequencing to spot the main genes and pathways involved in the different responses, and RT-qPCR to validate the expression values. Different grades of sensitivity to light spectra were associated with transcriptional reprogramming, plastid signals, and photosynthesis. The genotypes were especially divergent in the expression of genes regulated by transcription factors from MADS-box, WRKY, and NAC families, and in specific photoreceptors such as phytochromes and cryptochromes. Variations in light spectra also affected the expression of circadian clock, flowering time, and frost tolerance genes, among others, resembling plant responses to temperature. The relation between *PPD-H1*, *HvVRN1*, and *HvFT1* might explain genotypic differences. Light-sensitive genotypes experienced a partial reversion of the vernalization process and senescence-related stress under the less favorable light quality conditions. The observed light-quality sensitivities reveal a complex mechanism of adaptation to regions with specific light quality features and/or possible regulation of light spectra in plant development during early spring.

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Keywords

Transcriptome, *Hordeum vulgare* , light quality, development, transcription factors, cold-regulated genes, senescence.

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