The Arabidopsis bZIP transcription factor HY5 regulates expression of the; PFG1/MYB12; gene in response to light and ultraviolet-B radiation

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Plants fend off potentially damaging ultraviolet (UV)-B radiation by synthesizing and accumulating UV-B-absorbing flavonols that function as sunscreens. Regulation of this biosynthetic pathway is largely transcriptional and controlled by a network of transcription factors, among which the PRODUCTION OF FLAVONOL GLYCOSIDES (PFG) family of R2R3-MYB transcription factors was recently identified with a pivotal function. Here, we describe the response of Arabidopsis seedlings to narrow-band UV-B radiation at the level of phenylpropanoid pathway genes using whole-genome transcriptional profiling and identify the corresponding flavonol glycosides accumulating under UV-B. We further show that the bZIP transcriptional regulator ELONGATED HYPOCOTYL5 (HY5) is required for the transcriptional activation of the PFG1/MYB12 and PFG3/MYB111 genes under UV-B and visible light. A synthetic protein composed of HY5 with the VP16 activation domain is sufficient to activate PFG1/MYB12 expression in planta. However, even though myb11 myb12 myb111 triple mutants have strongly reduced CHS levels in darkness as well as in constant light, neither light- nor UV-B-inducibility seems impaired. Notwithstanding this, absence of the three PFG family transcription factors results in reduced UV-B tolerance, whereas PFG1/MYB12 overexpression leads to an increased tolerance. Thus, our data suggest that HY5-dependent regulation of PFG gene expression contributes to the establishment of UV-B tolerance.

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