DISTINCT TRANSCRIPTIONAL NETWORKS CONTROL ENVIRONMENT SENSING AND DEVELOPMENT IN WILD AND CULTIVATED GRAPEVINE GENOTYPES

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Environmental cues, such as light and temperature, are the most important factors used by plants to coordinate growth and development to external conditions, thus, maximizing evolutionary success and adaptation. As other perennial plant species, grapevine maintains a continuous vegetative growth program for two years, followed by a reproductive cycle coinciding with warmer temperatures and increased solar irradiance. The genus *Vitis* consists of approximately 60 interfertile species, including cultivated *V. vinifera* and *V. labrusca*, and several wild species that exhibit very distinct phenological behavior in response to the environment. Extensive transcriptional and metabolic programing contribute to the phenotypic plasticity of wild and cultivated grapevine genotypes adaptation to the ever-changing environment. Due to its commercial importance, these responses have exclusively been investigated in domesticated genotypes. In the current study, we have coupled high throughput transcriptional analyses with metabolic profiling to investigate environmental perception and growth responses in wild and cultivated grapevine material. The transcriptional and metabolic changes imposed by daylenght shortening and temperature decrease were more significant in wild grapevine, whereas both factors appear to hierarchically control the growth of domesticated grapevines, with a prevalent role of temperature in triggering developmental changes. Extensive cross talk between light and temperature sensing was observed in wild and cultivated genotypes, as shown for annual model species. The transcriptional profile of genes associated to carbohydrate metabolism was affected by temperature and photoperiod in the investigated genotypes, although to different extents. Genotypes exhibiting distinct growth behaviors in response to daylength and temperature also exhibit different morphological features of the plant shoot apex and carbohydrate profile. Taken together, our results suggest that the degree of coupling between environmental sensory pathways and carbohydrate metabolism is distinct in wild and cultivated grapevine genotypes and may be responsible for their distinct phenological behavior in response to temperature and light. These findings may contribute to candidate gene and genome wide selection strategies for grapevine breeding for distinct environments, including tropical conditions.

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