How do grapevine leaf phenolic contents respond to daily changes in environmental factors?

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Grapevine leaves are rich in phenolic compounds, many of which are – among fulfilling other roles – efficient antioxidants (Csepregi et al. 2016, Csepregi and Hideg 2017). The long-term aim of a recently launched project is to explore the functional plasticity of phenolic compounds in grapevine leaves. Here we present results of a pilot study, registering and analysing hour-by-hour changes in photosynthesis, phenolic profiles and antioxidant capacities of South-facing Pinot noir leaves between 7 am and 7 pm during a clear summer day mid-July at Pécs (N46.071°, E18.156°). During this 12h period, photosynthetically active radiation (PAR) was 80-2130 µmol/m^2/s and UV radiation (UV-A+B) varied between 5-46.1 kJ/m^2 as physical dose measured on site. Local data were separated into UV-B (280-315 nm) and UV-A (315-400 nm) regions based on a model calculation (NCAR).
Total adaxial flavonoid content (measured as Dualex flavonoid index) varied between 88% and 112% of the daily average and showed strong positive correlations with PAR, UV-A, UV-B, leaf temperature and net CO_2 assimilation. Stomatal conductance (g_s) was positively correlated with PAR, UV-A and UV-B. However, substomatal CO_2 concentrations (C_i) were only correlated with PAR (positively) and not with UV. Hourly changes in leaf antioxidant capacities and phenolic profiles measured with HPLC-DAD complete the analysis.

References

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NACR, the 5.2 version of the TUV model was accessed via the National Center for Atmospheric Research at http://cprm.acom.ucar.edu/Models/TUV/Interactive_TUV/

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