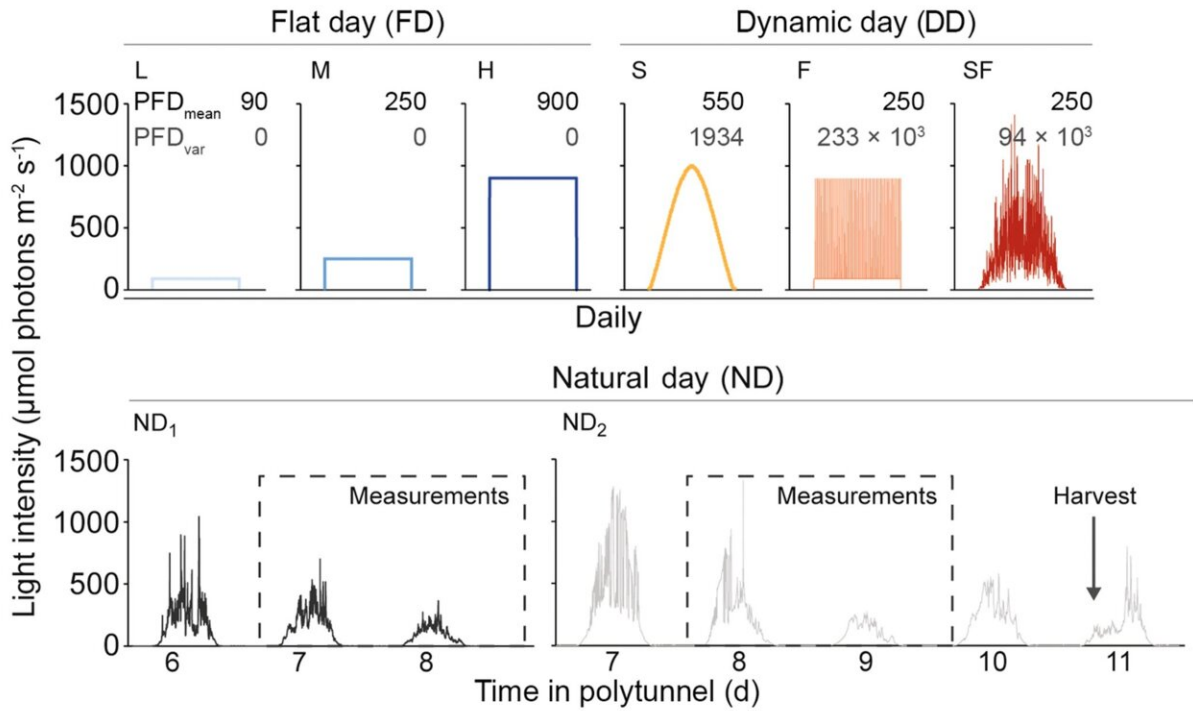


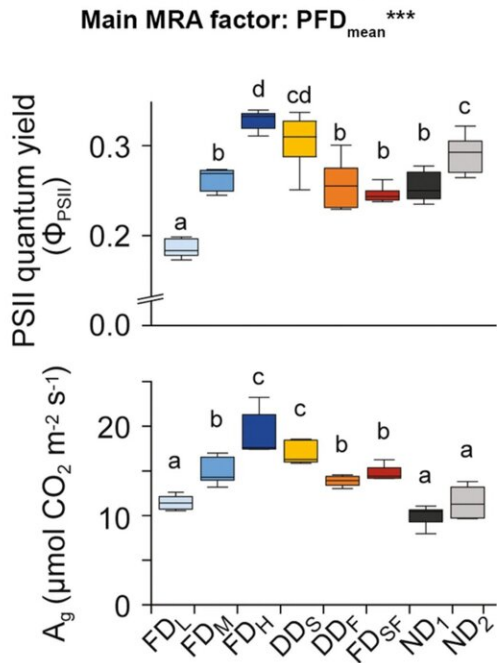
Between light and darkness: How plants optimize photosynthesis under changing light conditions

November 16 2022, by Ursula Ross-Stitt

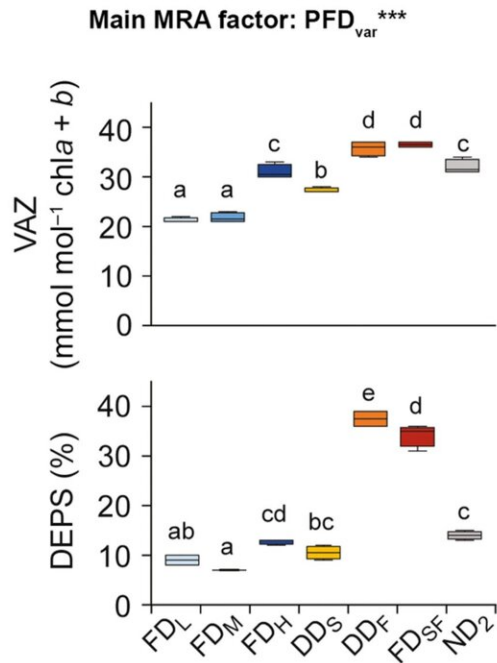
(a) Eight different light treatments



(b) Assimilation capacity



(c) Xanthophyll cycle



Environmental acclimation adjusts steady-state photosynthesis and thylakoid pigment composition. (a) *Arabidopsis thaliana* wild-type (WT) was grown in 12 h

: 12 h, light : dark cycles under constant growth light (flat day, FD) at indicated intensities (low, FD_L ; medium, FD_M ; and high, FD_H), dynamic growth light (dynamic day, DD) with varying degrees of light fluctuations (sinusoidal, DD_S ; step-wise fluctuating, DD_F ; sinusoidal with random light fluctuations, DD_{SF}) or natural growth conditions in a polytunnel (natural day; ND_1 and ND_2). Humidity and temperature, as well as light spectra, can be found in Fig. [S1](#). Average and variable photon flux densities (PFD_{mean} and PFD_{var} , respectively) are displayed (see Fig. [S1](#); Table [S1](#) for additional information). (b) PSII quantum efficiency (Φ_{PSII} , upper panel) at $700 \mu\text{mol photons m}^{-2} \text{s}^{-1}$ and gross assimilation rate (A_g , lower panel) at $900 \mu\text{mol photons m}^{-2} \text{s}^{-1}$ correlate positively with PFD_{mean} as the main factor as determined by multiple regression analysis (MRA). PFD_{mean} for ND was set as average of 3 d before the measurement. Averages of $n = 5-7 \pm \text{SE}$ are shown. (c) Levels of photoprotective xanthophylls (VAZ, sum of violaxanthin, antheraxanthin, zeaxanthin, and upper panel) and their de-epoxidation state (DEPS, lower panel) correlate positively with PFD_{var} as the main factor. Averages of $n = 4 \pm \text{SE}$ are shown. Thylakoid pigment content can be found in Table [S3](#). For thylakoid isolation, plants were removed from the growth chamber at 2 h after start of the light period and harvest of whole rosettes was performed in the laboratory at room light. (b, c) The middle line and the lower and upper boundaries of the box represent the median and the 25th and 75th percentile, respectively. Whiskers extend to the maximum and minimum. An ANCOVA was used to determine the effects of PFD_{mean} and PFD_{var} on the displayed parameters. The main factor is indicated on top of the panels with ***, *P*

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