

The secret lives of plants at night

Plant scientists have made significant strides in understanding how plants respond to environmental cues. Numerous pathways have been elucidated that describe how plants perceive and react to various environmental stresses. Importantly, most responses to both biotic and abiotic stressors are subject to circadian gating, where the plant's endogenous clock modulates the sensitivity and magnitude of the response based on the time of day. Despite this, the vast majority of stress response pathways have been characterized almost exclusively during daylight hours.

Our research demonstrates that when identical stressors are applied during the day and at night, plants exhibit markedly different responses. In the case of heat stress, many of the classically studied 'canonical' response pathways are notably absent during the nighttime. These findings suggest that our current understanding of plant stress physiology is incomplete, neglecting critical regulatory mechanisms that operate during the nighttime period. We propose that nighttime-specific responses, shaped in part by the circadian clock, may provide novel avenues for improving plant resilience to environmental stresses.

In addition, I will briefly address a technical challenge we encountered during RNA-Seq analysis when comparing samples collected at different times of day. We show how this issue can skew transcriptomic interpretations in many different assays, not only those comparing different times of the day, and demonstrate that the inclusion of RNA spike-ins offers a simple and effective approach for normalization and correction.