

Collective phase sensitivity and control of Arabidopsis circadian clock

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Precise measurement of phase response curve (PRC) is of great importance for understanding and regulating the entrainment of circadian clocks to environmental cycles. It is, however, often the case that the experimentally measured PRCs are rough and/or too much simplified. In this study, we applied periodic pulse stimuli to *Arabidopsis thaliana* circadian clock to construct the PRCs. Owing to the rich amount of our measurement data, cellular network of the plant circadian system was found to be capable of changing its sensitivity to environmental cues by the network coherence, i.e., synchronicity of the cellular network dynamics. Theoretical analysis clarified this change of PRC as a collective response of the cellular oscillators. We applied the phase response properties to control the synchronized/desynchronized dynamics of the plant circadian system.

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