

The expression of circadian clock gene promoters in Arabidopsis callus

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The circadian rhythms are the essential process that regulates plant responses in normal development and under stresses. Callus and cell suspension culture is widely used in studying the cellular processes and stress responses. As genetic and epigenetic instability commonly occurs in this system, the circadian oscillation might vary in different plant cell lines. We observe the expression of five clock gene promoters in Arabidopsis callus from AT2 cell suspension and callus induced from seedlings. All clock gene promoters showed rhythmic expression in both types of calli under 12/12 hours of light/dark cycles. However, under constant light, the expression persisted only in callus derived from seedlings. This indicates that this callus has the same circadian clocks as in the intact plants, but the expression of clock gene promoters in AT2 callus is light-regulated, but not circadian regulated. We investigated the possible factors that interfere the promoter expression: auxin, types of callus media, and parental tissues. We found that auxin 2,4-D did not change the amplitude of the expression in Arabidopsis seedlings under the light/dark cycles. This indicates that the light/dark cycles override the effect of auxin on clock gene promoters in seedlings and callus. Moreover, the expression of clock gene promoters did not change in AT2 callus grown on different media and callus induced by different media. Callus derived from various tissues also showed the similar expression pattern in the light/dark cycles and constant light. As AT2 callus had the rhythmic expression only in the light/dark cycles, this can be used as a tool for screening factors that can reset the clock. In contrast, the callus derived from seedlings can be used to investigate the interaction between interested genes and clock genes to better understand the circadian rhythms in plants.