Manipulating plants' circadian clock may make all-season crops possible

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Yale University researchers have identified a key genetic gear that keeps the circadian clock of plants ticking, a finding that could have broad implications for global agriculture.

The research appears in the Sept. 2 issue of the journal *Molecular Cell.*

"Farmers are limited by the seasons, but by understanding the circadian rhythm of plants, which controls basic functions such as photosynthesis and flowering, we might be able to engineer plants that can grow in different seasons and places than is currently possible," said Xing Wang Deng, the Daniel C. Eaton Professor of Molecular, Cellular, and Developmental Biology at Yale and senior author of the paper.

The circadian clock is the internal timekeeper found in almost all organisms that helps synchronize biological processes with day and night. In plants, this clock is crucial for adjusting growth to both time and day and to the seasons.

The clock operates through the cooperative relationship between "morning" genes and "evening" genes. Proteins encoded by the morning genes suppress evening genes at daybreak, but by nightfall levels of these proteins drop and evening genes are activated. Intriguingly, these evening genes are necessary to turn on morning genes completing the 24-hour cycle.

The Yale research solved one of the last remaining mysteries in this

process when they identified the gene DET1 as crucial in helping to suppress expression of the evening genes in the circadian cycle.

"Plants that make less DET1 have a faster clock and they take less time to flower," said lead author On Sun Lau, a former Yale graduate student who is now at Stanford University. "Knowing the components of the plant's circadian clock and their roles would assist in the selection or generation of valuable traits in crop and ornamental plants."

Provided by Yale University