ABSTRACT

"DNA replication and endocycle control in arabidopsis thaliana"

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Due to their sedentary life style, plants are unavoidably in close contact with agents that target their genome integrity. DNA stress is a recurrent problem in agriculture; not only because of an increase in UV-B irradiation due to depletion of the ozone layer, but also because of metalloid soil elements such as aluminum and boron. To sense and react to these treats, plants have evolved DNA stress checkpoint mechanisms to arrest the cell cycle when DNA replication errors or DNA breaks occur. In this way, cells can repair the damaged DNA before entering mitosis and prevent the propagation of mutations. The identification of such checkpoint mechanisms can help in obtaining corps with increased growth performance under genotoxic growth conditions. Previously we identified the cyclin-depenent kinase (CDK) inhibitory kinase WEE1 as an essential checkpoint regulator upon DNA replication stress. However, *WEE1* knockout plants do not suffer from double-strand breaks, suggesting redundant checkpoint mechanisms. On basis of a compendium of microarray experiments we identified a novel group of genes that are rapidly and strongly induced upon diverse forms of DNA stress in an ATM/ATR dependent manner. The encoded proteins bind directly to CDKs, to inhibit their activity and to arrest cells in the G2 phase of the cell cycle. Through knockout analysis we illustrated that these novel proteins, in combination with WEE1, control the adaptation of plants towards DNA stress.