MYB31 triggers water stress memory responses in maize

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HAL Id: hal-02955034

https://hal.inrae.fr/hal-02955034

Submitted on 1 Oct 2020

C29

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Water deficit directly impacts the ability of plants to intercept and convert light into biomass. Because leaf growth is one of the first processes affected by water deficit, many physiological studies concentrated in short-term responses and associated mechanisms. They demonstrated the roles of cellular and metabolic processes such as changes in cell turgor, hydraulic conductance and cell wall plasticity. However, our understanding of how water deficit impacts cell wall biosynthesis is still fragmentary. Here, we report that ZmMYB31, a R2R3-MYB transcription factor implicated in the regulation of lignin biosynthesis [1-2], is induced by water deficit in the growing zone of maize leaves. Consistent with this finding, we also showed that *ZmMYB31* colocates with quantitative trait loci for growth responses to water deficit and anthesis-silking interval (ASI) under water deficit conditions. To assess the potential contribution of *ZmMYB31* to maize responses to water deficit, we generated transgenic maize overexpressing *ZmMYB31*. We showed that increasing *ZmMYB31* expression in maize maintained ASI under water deficit conditions. On the basis of these data, we generated transcriptomic and proteomic data to detect transcripts and proteins that show substantial changes in abundance in the leaf growing zone of three representative independent transgene-positive homozygous maize lines compared with that of transgene-negative sibling plants grown in PhenoArch under well-watered and water deficit conditions. We identified 352 genes that were transcriptionally regulated by *ZmMYB31* under well-watered conditions and displayed opposite transcription levels under water deficit conditions, suggesting that *ZmMYB31* may function in a water stress memory response pathway, which likely helps the transgenic maize enduring the water deficit stress. Our studies further revealed co-expression relationships between these genes and others from the proteome and a cell wall data sets, suggesting potential regulatory influence.

Références bibliographiques

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[2] T. Agarwal et al. (2016) Sci. Rep., 6, 28502.

Mots-clés

ZmMYB31, maize, omics, water stress memory responses