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Functional analysis of *cryptochrome-interacting basic-helix-loop-helix1* (*OsCIB1*) in Controlling leaf angle and grain size in rice (*Oryza sativa*)

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[Introduction]

Cryptochrome-Interacting basic-helix-loop-helix (CIB), a critical transcription factor in plant, plays important roles associated several development processes, including hypocotyl elongation, flowering, and plastid development. In this study, we screened two T-DNA mutants to identify the function of *OsCIB1*. Especially, a rice gain of function mutant, *oscib1-D*, displayed wide leaf angles and slender grains, similar to plants with increased brassinosteroid (BR) levels or enhanced BR signaling.

[Materials and Methods]

The T-DNA insertion knockdown mutant of *OsCIB1* and T-DNA insertion overexpression mutant of *OsCIB1* in rice was isolated in the Korean japonica cultivar 'Dongjin' (hereafter termed wild type; WT) and was obtained from the Salk Institute Genomic Analysis Laboratory (http://signal.salk.edu/cgi-bin/RiceGE). Rice plants were grown in the paddy field of the Seoul National University Experiment Farm under natural long day (NLD) conditions (37°N latitude, Suwon, Korea).

[Results and Discussions]

In this study, our data provide evidence that *OsCIB1* involved in BR signaling and functions as a critical regulator of genes related to the cell elongation to make enlarged lamina joint in rice. Several results in this study support this conclusion: (ⅰ) *oscib1-D* showed exaggerated leaf angle via increased cell size in adaxial surface of lamina joints, whereas oscib1 had narrower leaf inclination than that of WT; (ⅱ) *oscib1-D* plants are sensitive to exogenous BR and alter expression of genes involved in BR signaling independent of BR biosynthesis; and (ⅲ) *OsCIB1* might directly regulates cell-elongation-related genes such as *OsEXPAs* and *OsXTHs* (xyloglucan endotransglycosylase/hydrolase). Transcriptome analysis identified that cell wall-related genes were upregulated in OsPIL1-OXs, which means that OsPIL1 can directly regulates downstream genes such as expansins and cellulose synthases. Moreover, the results of transient expression assay suggested that OsPIL1 could activate expression of the *OsEXPA4* and 1-ACC oxidase genes via the G-box element. Therefore, in this scenario, it is strongly possible that OsCIB1 is also involved in regulating cell-elongation-related genes.

[Acknowledgements]

This work was carried out with the support of the Cooperative Research Program for Agriculture & Technology Development (Project No. PJ011063), Rural Development Administration, Republic of Korea.

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