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CsRCI2D and CsRCI2G Have Different Characteristics under Temperature Stress in *Camelina sativa* L.

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[Introduction]

Camelina sativa L. is a bioenergy crop, which contains a large amount of linolenic acid in seed oil and is suitable for biodiesel production. Rare Cold Inducible 2 (RCI2) proteins were reported to be significantly induced by abiotic stress exposure such as low and high temperature, drought, and saline stress. According to previous study, overexpressing RCI2s enhances abiotic stress tolerance in many species, however, it is still remained uncharacterized RCI2s such as CsRCI2D and CsRCI2G under temperature stress. In this study, we analyzed different properties of CsRCI2D and CsRCI2G under low and high temperature stress in Camelina.

[Materials and Methods]

One-week-old Camelina seedlings were grown on hydroponics for 7 days. Temperature stresses were treated at 4 to 8 ^{o}C for low temperature and 32 to 37 ^{o}C for high temperature. Then, Camelina seedlings were sampled for qRT-PCR. To generate CsRCI2D and CsRCI2G over-expressed Camelina, each genes were cloned into pCB302-3 vector, then transformed by agrobacterium (GV3101) vacuum infiltration. Electrolyte leakage, chlorophyll contents, anthocyanin contents, MDA contents, seed germination, root length, hypocotyl length, DAB staining experiments were carried out to compare WT and OX lines.

[Results and Discussion]

In qRT-PCR, expression of *CsRCI2D* was increased by both low and high temperature stress. But *CsRCI2G* was increased only in low temperature stress. This result suggested that CsRCI2D and CsRCI2G have different response by different temperature stress. To analyze function of CsRCI2D and CsRCI2G, we generated CsRCI2D and CsRCI2G over-expression lines. The results of germination rate, root length, electrolyte leakage, and anthocyanin contents indicated that over-expression of CsRCI2D and CsRCI2G improve stress tolerance in low temperature. In contrast, CsRCI2D OX were enhanced high temperature stress tolerance but CsRCI2G OX were similar with WT. Meanwhile, hypocotyl length of WT and CsRCI2G OX lines were longer than CsRCI2D OX under high temperature stress. Moreover, chlorophyll contents were higher in CsRCI2D OX lines but were similar in WT and CsRCI2G OX lines under high temperature stress. Altogether, CsRCI2D contribute tolerance of both low and high temperature stress but CsRCI2G improves low temperature stress tolerance.

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