MORF9 mediating plastid RNA editing influences Arabidopsis root growth under sugar starvation

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Abstract

RNA editing converts cytidines to uridines in the RNAs transcribed from the chloroplast and mitochondrial genomes in flowering plants. Multiple organellar RNA editing factor (MORF) complex is discovered to be highly associated with C-to-U RNA editing activity of vascular plant editosome. However, mechanism of MORF9 mediating plastid RNA editing controlling plant development and in response to environmental cues remains limited. In this study, we found that loss of MORF9 function impaired PSII efficiency, NDH activity, and carbohydrate production, rapidly promoted nuclear gene expression including sucrose transporter and sugar/energy responsive genes, exhibiting a retard seedling development under sugar starvation condition. When exogenous application of sugar increased transcript and protein level of MORF9 and MORF2 in wild-type, and enhanced the decreasing of *matK-706C, accD-794C*, *ndhD-383C* and *ndhF-290C* RNA editing efficiency in *morf9* mutant, and partially recovered altered cell division of root meristem zone, and nuclear gene expression in *morf9* mutant. Using *gin2, snrk1, morf9* single and double mutants and overexpressing *SnRK1 (KIN10)* or *HXK1* in *morf9* mutant background genetically addressed that RNA editing efficiency of *ndhD-383C* and *ndhF-290C* sites was declined in the *gin2morf9*, that of *matK-706C, accD-794C, ndhD-383C and ndhF-290C* sites was significantly declined in the *snrk1morf9*, while overexpressing *HXK1* or *SnRK1* promoted RNA editing rate of *matK, accD, ndhD,* and *ndhF* in leaves of *morf9* mutant,indicating that HXK1 might require for MORF9 mediating *ndhD-383C* and *ndhF-290C* editing, SnRK1 only require for MORF9 mediating *ndhF-290C* site editing. It suggests that sugar as an energy/sugar signal impairs MORF9 mediating plastid RNA editing affecting plant root development.

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