# MORF9 mediated plastid RNA editing influences Arabidopsis root growth under sugar starvation

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## Abstract

RNA editing is a tightly controlled process by which cytidines are converted to uridines in RNAs transcribed from the chloroplast and mitochondrial genomes in flowering plants. Multiple organellar RNA editing factor (MORF) complex was recently shown to be highly associated with C-to-U RNA editing activity of vascular plant editosome. However, mechanisms by which MORF9 mediates plastid RNA editing to control plant development in response to environmental cues remains obscure. 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, and attenuated seedling development under sugar starvation conditions. Sugar repletion increased MORF9 and MORF2 expression in wild-type seedlings and promoted inefficiency of *matK-706C, accD-794C*, *ndhD-383C* and *ndhF-290C* RNA editing in *morf9* mutant. This RNA editing inefficiency was associated with altered cell division in root meristem zone and nuclear gene expression in the *morf9* mutant. Using *gin2, snrk1, morf9* single and double mutants and overexpression of *SnRK1 (KIN10)* or *HXK1* in the *morf9* mutant background demonstrated that RNA editing efficiency of *ndhD-383C* and *ndhF-290C* sites was diminished in the *gin2/morf9* double mutants, and editing efficiency of *matK-706C, accD-794C, ndhD-383C* and *ndhF-290C* sites was significantly diminished in the *snrk1/morf9* double mutants. Overexpressing *HXK1* or *SnRK1* promoted RNA editing rate of *matK, accD, ndhD,* and *ndhF* in leaves of *morf9* mutants,indicating that HXK1 might be required for MORF9 mediated *ndhD-383C* and *ndhF-290C* editing, while SnRK1 may only be required for MORF9 mediated *ndhF-290C* site editing. Collectively these findings suggest that sugar and/or its intermediary metabolites impair MORF9 mediated plastid RNA editing resulting in derangements of plant root development.

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