PtrDJ1C, an atypical member of the DJ-1 superfamily, is essential for early chloroplast development and lignin deposition in poplar

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Abstract: The nuclear-encoded factors and the photosynthetic apparatus have been studied extensively during chloroplast biogenesis. However, many questions regarding these processes remain unanswered, particularly in perennial woody plants. This study reports the Populus trichocarpa DJ-1C (PtrDJ1C) factor, encoded by a nuclear gene, and a member of the DJ-1 superfamily. PtrDJ1C knock-out with the CRISPR/Cas9 system resulted in different albino phenotypes. Chlorophyll fluorescence and immunoblot analyses showed that the levels of photosynthetic complex proteins decreased significantly. Moreover, the transcript level of plastid-encoded RNA polymerase-dependent genes and the splicing efficiency of several introns were affected in the mutant line. Furthermore, rRNA accumulation was abnormal, leading to developmental defects in chloroplasts and affecting lignin accumulation. We conclude that the PtrDJ1C protein is essential for early chloroplast development and lignin deposition in poplar.