The roles of ATP synthase and the cytochrome b_6/f complexes in limiting chloroplast electron transport and determining photosynthetic capacity

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Supplemental Figure Legends

Fig. S1

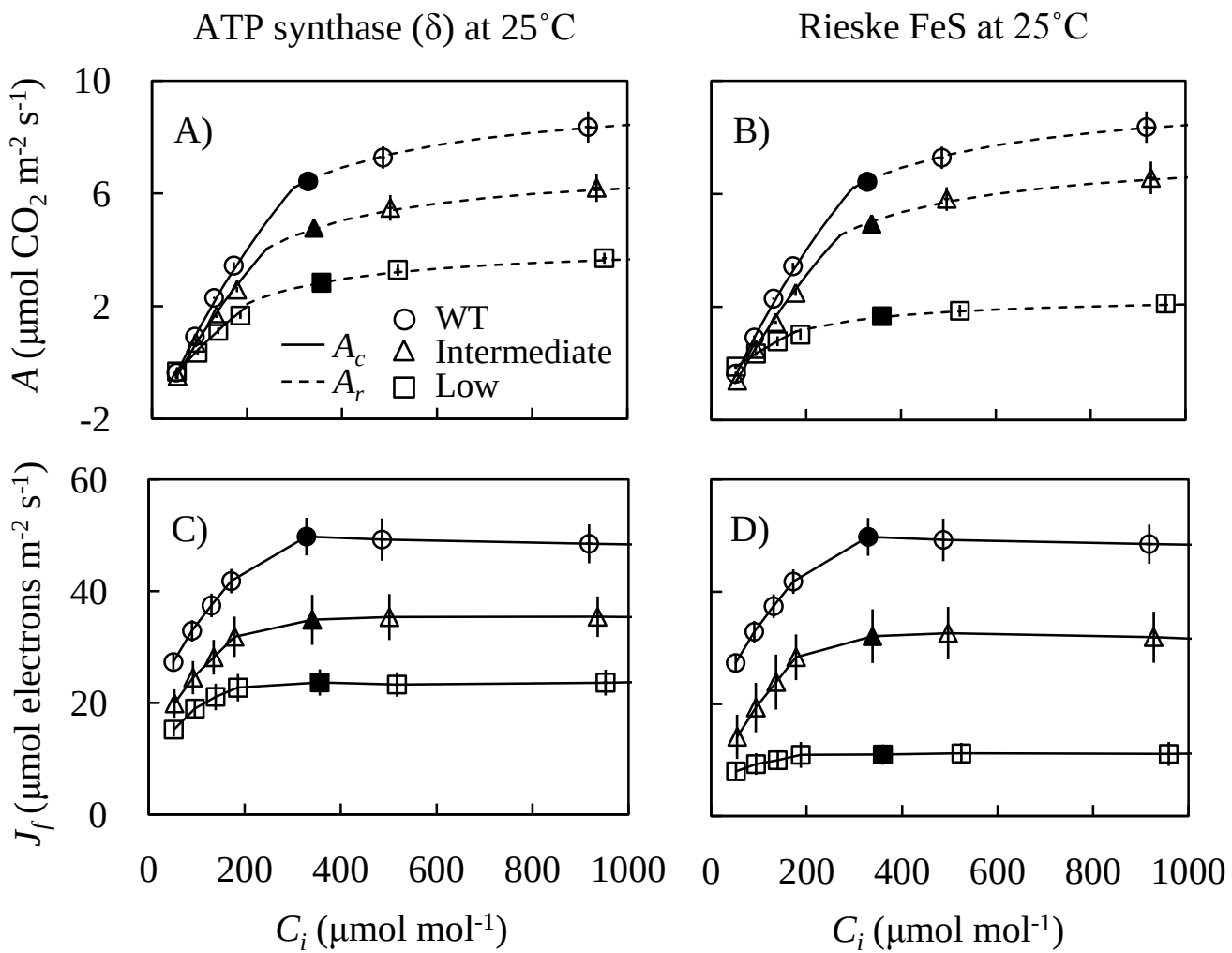
CO_2 response of CO_2 assimilation rate (*A*) and electron transport rate (ETR) at 25°C. CO_2 response of CO_2 assimilation rate (*A*) measured at 25°C and 1200 µmol photons m^{-2} s^{-1} in anti-ATP synthase (δ) lines (A) or anti-Rieske FeS lines (B). Three groups were classified with respect to ATP synthase (δ) content or Rieske FeS content: Rieske FeS: WT (approximately 100%: circle), plants with intermediate Rieske FeS level (58~85%: triangle) and plants with low Rieske FeS level (27~29%: square); ATP synthase (δ): WT (approximately 100%), plants with intermediate ATP synthase (δ) level (48~75%) and plants with low ATP synthase (δ) level (22~26%). CO_2 assimilation rate at 380 µmol mol^{-1} CO_2 concentration (A_{380}) is shown as a solid symbol. CO_2 assimilation rate limited by RuBP carboxylation (A_c: solid line) whereas CO_2 assimilation rate limited by RuBP regeneration (A_r: dotted line). Curve fitting was described in the material and methods section. CO_2 response of the electron transport rate (ETR) from Chl fluorescence at 25°C at 1200 µmol photons m^{-2} s^{-1} in anti-ATP synthase (δ) lines (C) or anti-Rieske FeS lines (D). ETR at 380 µmol mol^{-1} CO_2 concentration is shown as a solid symbol. Data represent means ±SE, n = 3~4.

Fig. S2

CO_2 response of CO_2 assimilation rate (*A*) and electron transport rate (ETR) at 40°C. CO_2 response of CO_2 assimilation rate (*A*) measured at 40°C and 1200 µmol photons m^{-2} s^{-1} in anti-ATP synthase (δ) lines (A) or anti-Rieske FeS lines (B). Three groups were classified with respect to ATP synthase (δ) content or Rieske FeS content: wild type (circles), plants with intermediate contents of ATP synthase (δ) or Rieke FeS protein (triangles) and plants with low contents of ATP synthase (δ) or Rieke FeS protein (squares), as mentioned in Fig. S1. CO_2 assimilation rate at 380 µmol mol^{-1} CO_2 concentration (A_{380}) is shown as a solid symbol. CO_2 assimilation rate limited by RuBP carboxylation (A_c: solid line) was whereas CO_2 assimilation rate limited by RuBP regeneration (A_r: dotted line). Curve fitting was described in the material and methods section. CO_2 response of the electron transport rate (ETR) from Chl fluorescence at 40°C at 1200 µmol photons m^{-2} s^{-1} in anti-ATP synthase (δ) lines (C) or anti-Rieske FeS lines (D). ETR at 380 µmol mol^{-1} CO_2 concentration is shown as a solid symbol. Data represent means ±SE, n = 3~4.

Fig. S3

Rubisco activation state, Rubisco and Rubisco activase content. Content of Rubisco (A, B) and Rubisco activase (C, D), and Rubisco activation state (E, F) in antisense plants with a variety of δ subunit of chloroplast ATP synthase (A, C & E) and in antisense plants with a variety of Rieke FeS contents (B, D & F). The contents of several photosynthetic components, including Rubisco and Rubisco activase, were similar among wild type, anti-Rieske FeS plants and anti-ATP synthase (δ) plants. The optimum temperature for A_{380} was 32.3±0.4°C in WT and was similar among WT, anti-Rieske FeS and anti-ATP synthase (δ). Rubisco activation state at 40°C decreased by 7~8% compared to 25°C in WT. Rubisco activation state declined only by approximately 10% at both 25 and 40°C in anti-ATP synthase (δ) plants with an ATP synthase (δ) content of less than 20% of wild-type. On the other hand, Rubisco activation state declined by approximately 20% both at 25 and 40°C in plants with Rieske FeS content lower than 20% of wild-type



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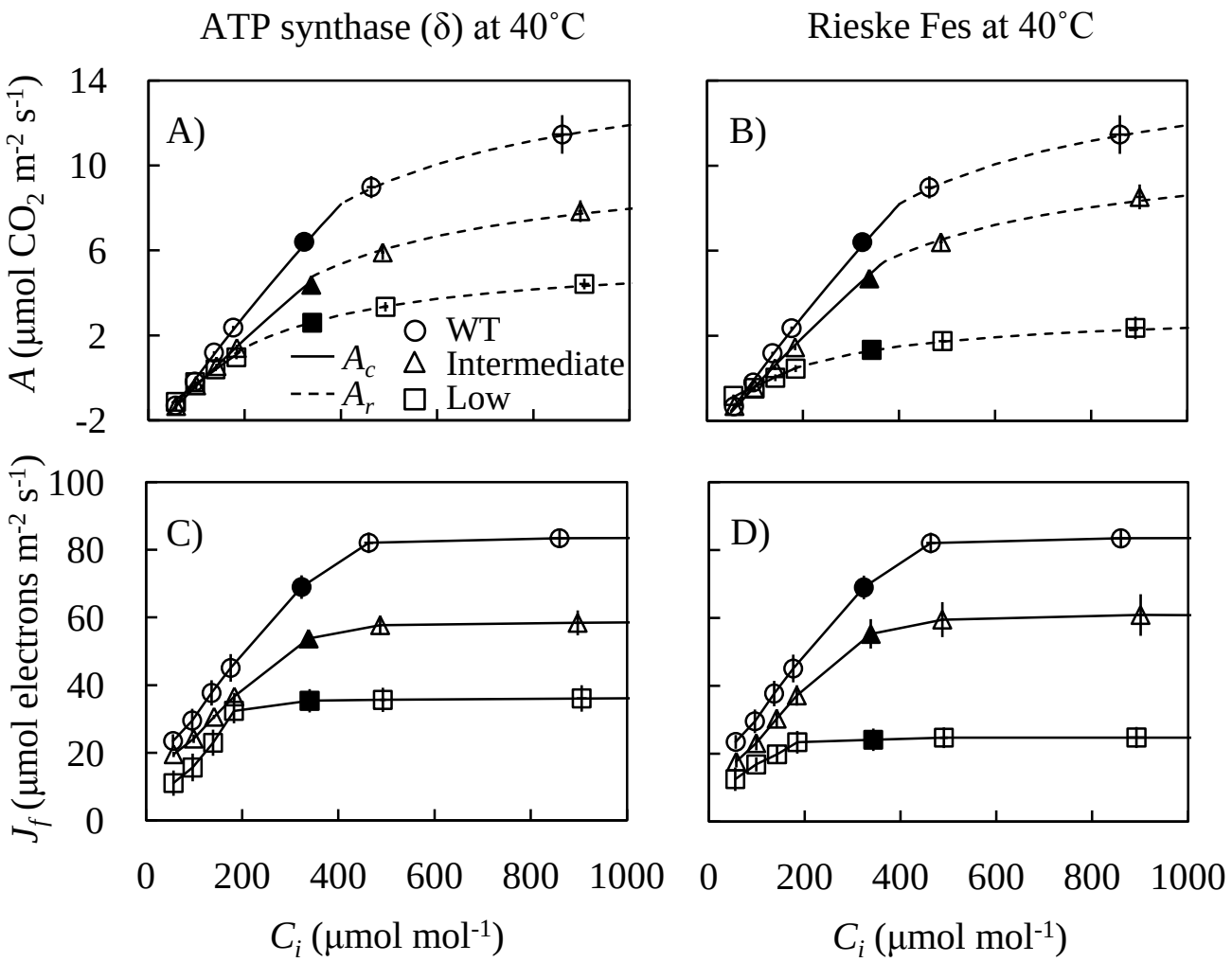

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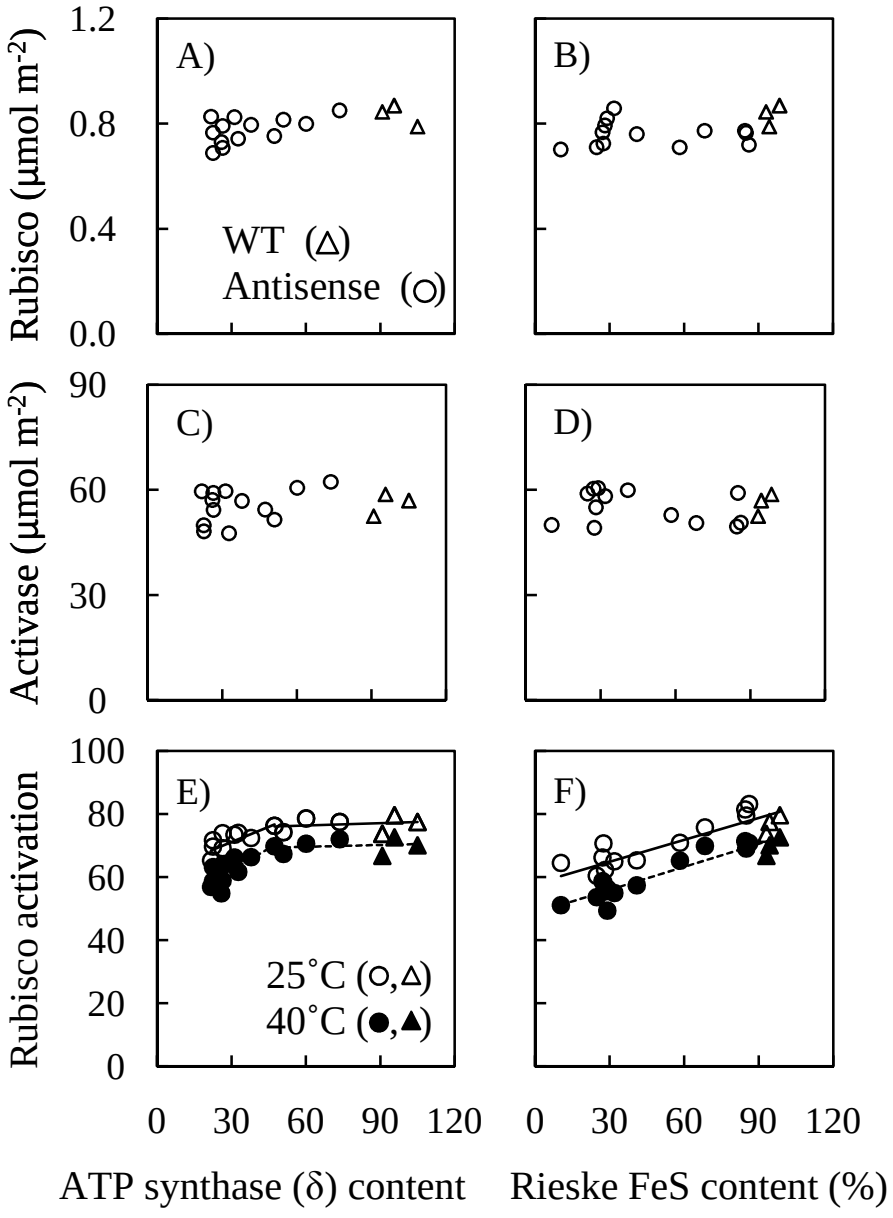

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