Supplementary Material

# Supplementary Figures and Tables

## Supplementary Figure



**Supplementary Figure 1.** A simplified schematic diagram of electron transport in photosynthesis modified from (Shevela and Björn, 2018). Chloroplasts contain a large number of other proteins in addition to the four major membrane protein complexes (PSII; Cyt *b6f*; PSI; and ATPase). Mn4CaO5, manganese-calcium-oxygen complex; Yz, redox-active tyrosine (Tyr Z); P680 and P700, primary electron donors of Photosystem II (PSII) and Photosystem I (PSI) of the first excited states of special reaction center Chl *a* molecules; Pheo, pheophytin, primary electron acceptor of PSII; QA and QB, primary and secondary quinone electron acceptors; PQ, mobile plastoquinone molecules between PSII and Cyt *b6f*; Fes, Rieske iron-sulfur protein; Cyt *f*, cytochrome *f*; PC, plastocyanin, mobile copper protein between Cyt *b6f* andPSI; A0, primary electron acceptor of PSI; A1, pair of phylloquinone (vitamin K) molecules; FX, FA, and FB, bound iron-sulfur clusters of PSI; Fd, ferredoxin; FNR, ferredoxin-NADP oxidoreductase.



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**Supplementary Figure 2.** Radar plots of each nitrogen treatment with a series of important parameters derived from experimental fast OJIP transients during different growth stages.



**Supplementary Figure 3.** Comparison of radar plots with important parameters during tillering, jointing, initial heading, and late filling stages in 2018 and 2019, respectively.

## Supplementary Table

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **TABLE S1 | Average chlorophyll content of each layer leaf during different growth stages. Values are means ± SD (*n* = 4). Values within a column followed by the same letters are not significantly different (*P* ≥ 0.05, Fisher's LSD test).** | | | | | | | | | | |
| Nitrogen level | Leaf position | Growth stages | | | | | | | | |
| V1 | V2 | V3 | R1 | R2 | R3 | R4 | R5 |
| N0 | L1 | 46.62 ± 4.76a | 44.20 ± 8.43a | 39.75 ± 6.44a | 32.57 ± 4.09a | 32.82 ± 5.00ab | 21.67 ± 5.77b | 12.66 ± 3.82c | 8.60 ± 3.64a |
| L2 | 44.25 ± 3.17a | 40.63 ± 4.63a | 40.60 ± 5.20a | 28.19 ± 5.31b | 29.82 ± 5.48b | 24.53 ± 6.38a | 23.02 ± 8.20b | 9.50 ± 3.29a |
| L3 | 32.64 ± 7.30b | 36.13 ± 6.00b | 39.41 ± 5.08a | 27.16 ± 5.00b | 32.79 ± 7.54ab | 27.02 ± 6.06ab | 21.90 ± 4.71b | 10.57 ± 3.66a |
| L4 | - | - | 29.99 ± 6.19b | 27.12 ± 4.21b | 34.77 ± 4.62a | 29.23 ± 4.61a | 25.97 ± 5.42ab | 10.08 ± 3.44a |
| L5 | - | - | - | - | - | 31.76 ± 3.05a | 29.18 ± 5.33a | - |
| N1 | L1 | 46.44 ± 6.08a | 44.48 ± 9.44ab | 43.64 ± 7.61ab | 49.99 ± 4.47a | 47.73 ± 4.45a | 35.02 ± 7.53a | 18.73 ± 9.32c | 19.48 ± 7.31a |
| L2 | 46.53 ± 5.23a | 45.70 ± 3.93a | 47.01 ± 6.60a | 44.97 ± 5.01b | 45.73 ± 5.49c | 34.65 ± 6.34a | 31.90 ± 3.94b | 18.76 ± 6.01a |
| L3 | 39.70 ± 7.44b | 41.22 ± 8.79b | 45.53 ± 6.83a | 40.22 ± 4.85c | 45.98 ± 4.67c | 38.52 ± 4.46a | 32.02 ± 4.20b | 15.51 ± 5.46a |
| L4 | - | - | 40.24 ± 8.97b | 30.66 ± 3.09d | 47.41 ± 4.88b | 35.10 ± 6.58a | 32.41 ± 5.27ab | 15.32 ± 4.97a |
| L5 | - | - | - | - | - | 39.21 ± 3.62a | 36.63 ± 3.66a | - |
| N2 | L1 | 43.64 ± 7.24b | 49.43 ± 10.63a | 53.13 ± 6.29a | 56.87 ± 5.24a | 51.39 ± 4.47a | 45.37 ± 7.41a | 22.34 ± 6.89b | 17.99 ± 5.59a |
| L2 | 48.27 ± 4.66a | 48.43 ± 11.45a | 54.39 ± 6.46a | 50.36 ± 5.21b | 43.95 ± 4.94b | 46.95 ± 3.45a | 36.78 ± 4.29a | 16.97 ± 2.61a |
| L3 | 38.54 ± 8.34c | 48.53 ± 11.40a | 55.12 ± 7.21a | 43.27 ± 5.75c | 41.07 ± 4.45b | 44.36 ± 4.40a | 37.03 ± 5.67a | 16.27 ± 1.05a |
| L4 | - | - | 41.54 ± 8.96b | 30.31 ± 4.31d | 41.65 ± 6.68b | 40.78 ± 8.35b | 37.42 ± 4.99a | 17.02 ± 5.11a |
| L5 | - | - | - | - | - | 43.08 ± 4.74ab | 40.10 ± 4.21a | - |