Table S1. Soil basic biochemical properties under nitrogen and water addition conditions.

|                  | CK            | CN            | CW            | CWN           |
|------------------|---------------|---------------|---------------|---------------|
| SOM (g·kg⁻¹)     | 46.65±11.51 b | 98.66±20.53 a | 46.17±10.60 b | 64.07±4.87 ab |
| TN (g·kg⁻¹)      | 1.06±0.19 a   | 1.27±0.05 a   | 0.99±0.15 a   | 1.31±0.06 a   |
| TP (g·kg⁻¹)      | 0.36±0.06 a   | 0.40±0.04 a   | 0.33±0.05 a   | 0.44±0.04 a   |
| AN (mg·kg⁻¹)     | 124.71±23.13 b| 193.77±18.81 a| 125.27±23.06 b| 177.53±15.31 ab|
| AP (mg·kg⁻¹)     | 25.14±3.50 a  | 25.84±0.69 a  | 22.78±3.94 a  | 29.64±0.66 a  |
| pH value         | 4.40±0.12 ab  | 4.14±0.07 b   | 4.60±0.08 a   | 4.19±0.06 b   |
| Urease (mg NH₃-N·g⁻¹ soil·d⁻¹) | 26.79±3.46 a | 36.52±2.97 a  | 26.69±3.57 a  | 33.02±1.60 a  |
| Sucrase (mg Glucose·g⁻¹ soil·d⁻¹) | 214.71±28.51 a | 263.50±9.38 a | 210.26±26.30 a | 250.26±9.31 a |
| Nitrate reductase (mg NO₂·g⁻¹·d⁻¹) | 8.46±1.39 a  | 10.52±1.06 a  | 7.98±1.62 a   | 11.07±0.98 a  |
| MBC (mg·kg⁻¹)    | 357.49±25.27 a| 416.89±16.19 a| 357.45±22.28 a| 390.85±12.07 a|
| MBN (mg·kg⁻¹)    | 59.10±3.45 a  | 63.06±2.38 a  | 58.19±4.43 a  | 64.60±2.09 a  |

In the same row, different lowercase letters mean significant differences under four treatments according to ANOVA with LSD tests (P < 0.05). CK, control treatment; CN, canopy N addition; CW, canopy water increase; CWN, canopy water and N addition. SOM, soil organic matter; TN, soil total nitrogen; TP, soil total phosphorus; AN, available nitrogen; AP, available phosphorus; MBC, soil microbial biomass carbon; MBN, soil microbial biomass nitrogen.
Figure S1. Canopy nitrogen addition and water increase device, a triangular iron tower with a height of 35 m, was built in the center of each circular quadrat.
Figure S2. The PCA based on physiological traits of *Q. variabilis* under N and water addition conditions. CK, white circle; CN, white inverse triangle; CW, white diamond; CWN, white square. Chl a, chlorophyll a; Chl b, chlorophyll b; SLA, specific leaf area; NSCs, non-structural carbohydrates.
Figure S3. The PCA based on physiological traits of *L. formosana* under N and water addition conditions. CK, black circle; CN, black inverse triangle; CW, black diamond; CWN, black square. Chl a, chlorophyll a; Chl b, chlorophyll b; SLA, specific leaf area; NSCs, non-structural carbohydrates.