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Characteristic of gas exchange and chlorophyll fluorescence parameters in leaves of *Lespedeza davurica*

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Key words : gas exchange parameters, chlorophyll fluorescence, simulated photosynthetic, CO₂ concentrations, *Lespedeza davurica*

Introduction This paper tests and analyzes the net photosynthetic rate (P_n), transpiration rate (T_r), stomatal conductance (G_s), intracellular CO₂ concentration (C_i), minimal fluorescence yield (F_o), maximum fluorescence yield (F_m), variable fluorescence yield (F_v) and electron transport rates (ETR) to reveal the physiological and ecological characteristics of *Lespedeza davurica*.

Materials and methods *Lespedeza davurica* belongs to *Lespedeza Michx* of *Leguminosae*. It was measured with LI-6400 portable photosynthesis system and comparative analysis was made. Light intensity was controlled by 2BLED of LI-6400. In a similar way, CO₂ concentration was controlled by CO₂ scrubber and the temperature of leaves was regulated by controller of LI-6400. The leaf area of *Lespedeza davurica* was measured by an area meter (LI-3000A). All of the digital information was analyzed by SPSS 13.0 and Microsoft Excel for Windows.

Results We can know from figure 1 that *Lespedeza davurica* shows evident photosynthetic potentiality for the increase of CO₂ concentration. The figure 2 showed the relaxation rate of *Lespedeza davurica*. When the leaves of *Lespedeza davurica* changed from dark to light, the qP and NPQ elevated gradually with the increase of illumination time. About 24min later, the qP and NPQ tended to be stable and quenching. The trend of $PhiPS2$ change was influenced by ETR .

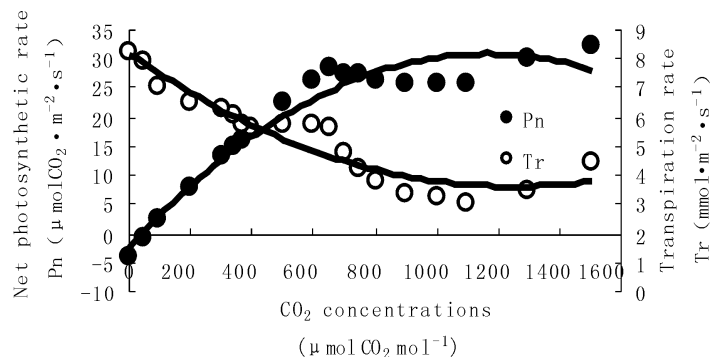


Figure 1 Responses of photosynthetic rate (P_n) and transpiration rate (T_r) to increasing CO₂ concentrations.

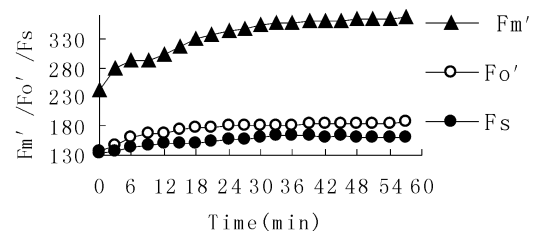


Figure 2 Chlorophyll fluorescence parameters of leaves of *Lespedeza davurica* in relaxation.

Conclusions This experiment showed that water stress is one reason for inhibition in photosynthetic ability after the light intensity over $1600 \mu\text{mol m}^{-2} \text{s}^{-1}$. So strong light should couple sufficient water condition and can promote the efficiency of light energy. The significantly positive correlation exists between T_r and G_s of *Lespedeza davurica* ($P < 0.01$). But there was significantly negative correlation between P_n and RH . High humidity air may be one reason for inhibition in photosynthetic ability for experiment spot in closure area of Taihang Mountain. The qP and NPQ of *Lespedeza davurica* gradually increases with illumination time, showing the higher ability of heat dissipation and efficiently avoided the damage of photosynthetic apparatus from excess light energy. The NPQ was lower after 27min because of the increase of photochemical quenching. But it may be caused by the interior control of photosystem enzymes, which is a problem of great complexity. The exact mechanism remains to be studied further.

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