



University of Kentucky  
UKnowledge

International Grassland Congress Proceedings

21st International Grassland Congress / 8th  
International Rangeland Congress

## Characteristic of Gas Exchange and Chlorophyll Fluorescence Parameters in Leaves of *Lespedeza davurica*

Dong Lin

*Gansu Agricultural University, China*

Huiling Ma

*Gansu Agricultural University, China*

Shihai Lu

*Chinese Research Academy of Environmental Sciences, China*

Chaoyang Feng

*Chinese Research Academy of Environmental Sciences, China*

Follow this and additional works at: <https://uknowledge.uky.edu/igc>



Part of the [Plant Sciences Commons](#), and the [Soil Science Commons](#)

This document is available at <https://uknowledge.uky.edu/igc/21/1-5/17>

The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

---

This Event is brought to you for free and open access by the Plant and Soil Sciences at UKnowledge. It has been accepted for inclusion in International Grassland Congress Proceedings by an authorized administrator of UKnowledge. For more information, please contact [UKnowledge@lsv.uky.edu](mailto:UKnowledge@lsv.uky.edu).

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

LIN Dong<sup>1,2</sup>, MA Hui-ling<sup>1</sup>, LV Shi-hai<sup>2</sup>, FENG Chao-yang<sup>2</sup>

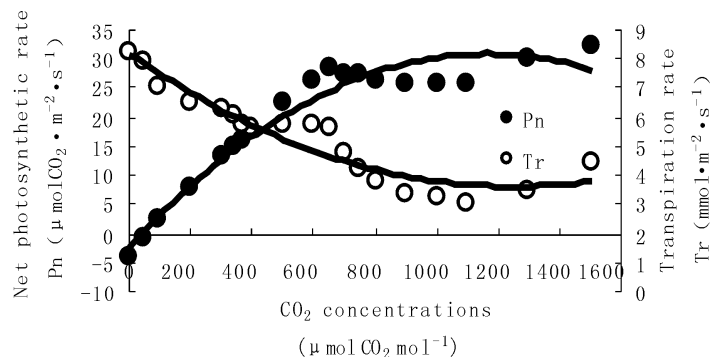
<sup>1</sup>. College of Prataculture, Gansu Agricultural University, Lanzou 730070, China, E-mail: lingrass@163.com, <sup>2</sup>. Institute of Ecology, Chinese Research Academy of Environmental Sciences, Beijing 100012, China

**Key words :** gas exchange parameters, chlorophyll fluorescence, simulated photosynthetic, CO<sub>2</sub> concentrations, *Lespedeza davurica*

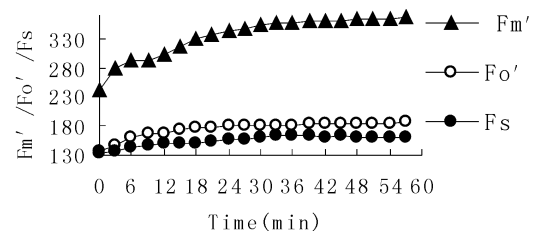
**Introduction** This paper tests and analyzes the net photosynthetic rate ( $P_n$ ), transpiration rate ( $T_r$ ), stomatal conductance ( $G_s$ ), intracellular CO<sub>2</sub> concentration ( $C_i$ ), minimal fluorescence yield ( $F_o$ ), maximum fluorescence yield ( $F_m$ ), variable fluorescence yield ( $F_v$ ) 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, CO<sub>2</sub> concentration was controlled by CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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.

### References

- JIANG G M, LIN GH, Bruno DV Marino. Changes in stomata conductance, transpiration and water use efficiency of ten species experienced in high CO<sub>2</sub> concentrations in biosphere 2. *Acta Botanica Sinica*. 1997, 39(6): 546-553.
- Rohacek K. Chlorophyll fluorescence parameters: the definitions, photosynthetic meaning and mutual relationships. *Photosynthetica*, 2002, 40(1): 13-29.