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A test of the rapid measurement of leaf photosynthesis-intercellular CO_2 concentration response curve of an evergreen shrub *Viburnum Odoratissimum*

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Plant photosynthetic physiology is a crucial process reflecting plant growth and productivity. The maximum rate of Rubisco carboxylation ($V_{c,max}$) and the maximum rate of electron transport (J_{max}) of plant leaves are the main limiting factors of photosynthetic capacity and indispensable parameters in ecosystem mechanism models. Accurate simulation of $V_{c,max}$ and J_{max} is vital to improve the prediction precision of vegetation dynamics under the background of climate changes. However, using traditional CO_2 response curves to obtain $V_{c,max}$ and J_{max} was time-consuming (about 30 to 60 minutes for each CO_2 response curve) and labor-intensive in the field. The rapid photosynthesis-intercellular CO_2 concentration (A-Ci) response technique (RACiR) provided a potential convenient way to obtain A-Ci curve in an open gas exchange system, which would greatly improve the measurement efficiency. Nevertheless, whether the RACiR detecting method verified by limited conifers and deciduous species (especially poplar trees) in previous studies could be generally used for other plant functional groups remains unclear.

Therefore, here we selected *Viburnum Odoratissimum* as the target and used Li-cor 6800 to test the applicability of the rapid RACiR detecting method on evergreen species. As the changes of CO_2 ranges and rates are the most important parameters in the method, we set 10 different change ranges of reference [CO_2] (i.e., 400-1500 ppm, 400-200-800 ppm, 420-20-620 ppm, 420-20-820 ppm, 420-20-1020 ppm, 420-20-1220 ppm, 420-20-1520 ppm, 420-20-1820 ppm, 450-50-650 ppm, 650-50-650 ppm) to verify the accuracy of traditional CO_2 response curves and RACiR and to explore suitable [CO_2] change ranges for evergreen species.

Finally, our results showed that $V_{c,max}$ and J_{max} calculated by 10 rapid A-Ci response curves except J_{max} calculated by 650-50-650 ppm [CO_2] were not significantly different from those calculated by

traditional A-Ci response curves. Moreover, 400-200-800 ppm [CO_2] compared with the other [CO_2] ranges was suitable for *V. Odoratissimum*. Our results indicated the advantage of RACiR method for evergreen species and implied that preliminary experiments should be carried out according to specific tree species to determine the most appropriate change range of [CO_2] when using RACiR to calculate $V_{c,max}$ and J_{max}.