# Study on Water Use Efficiency of Quercus Mongolica and American Red Dragonfly

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## Abstract

**In this experiment, the growth of the disease-free insects, the annual Mongolian oak, the biennial Mongolian oak, and the American red dragonfly were used as the research objects, and the Li-6400XT portable photosynthesis analyzer was used for the determination, and the specific leaf area of the leaves was calculated, and the data was processed later. . The measured indicators of this test include: net photosynthetic rate (Pn), transpiration rate (Tr), instantaneous water use efficiency (WUE), stomatal conductance (Cond), intercellular CO2 concentration (Ci).The results showed that water use efficiency is a comprehensive reflection of plant photosynthesis and transpiration characteristics. Its size can reflect the ability of plants to adapt to stress, and their photosynthesis rate, transpiration rate and stomatal conductance are lower than those of American red carp. The photosynthesis rate, transpiration rate and stomatal conductance of red leaves and red sorghum green leaves, while the water use efficiency of annual leaves of Quercus mongolica and the leaves of two-year-old Quercus mongolica were above the water use efficiency of red sorghum red leaves and American red sorghum green leaves, and At about 10 am, the water use efficiency of annual leaves of Quercus mongolica and the leaves of two-year-old Quercus mongolica was significantly higher than other times.**

## Keywords

**Quercus mongolica; American red dragonfly; water use efficiency; specific leaf area.**

## 1. Introduction

Quercus mongolica, also known as eucalyptus, Mongolian oak, lobular shed, and Mongolian ridge, is a genus of genus and deciduous trees. It has about 450 species of genus [1,2] and occupies the earth's terrestrial ecosystem. In 1985, the International Union of Forestry Research Organization (IUFRO) established a working group on tree genetics. Quercus mongolica is a representative species of deciduous mites in northern China. It is widely distributed in the three northeastern provinces of China and Inner Mongolia. It is the main timber species in China and the main species of secondary deciduous broad-leaved forests in Northeast China. Mongolian oak has hard wood, clear and beautiful texture, and has anti-corrosive biological characteristics [3].

It can be used as economic material. Mongolian oak has developed root system and strong adaptability, which can better protect slope, resist and culvert. The role of water and soil conservation; its branches have higher heat and can be used as fuelwood; the leaves of Mongolian oak can also be used to feed silkworms and raise animals. Quercus mongolica has important ecological and economic value[3,4]. Therefore, Mongolian oak has become a secondary protected tree species in China. However, people did not really realize the growth characteristics of Quercus mongolica. In the case of poor growth of its stand, it was still deforested, which greatly damaged the resources of Quercus mongolica. Quercus mongolica is a dominant species that has been preserved during retrograde succession and is a type of community formed in habitats where forests are repeatedly damaged and environmental conditions are extremely poor. As some scholars have pointed out, if this tree species is destroyed again, the last line of defense of the forest will collapse and the ecological environment will deteriorate further. The consequences are unimaginable. The secondary forests with Quercus mongolica as a group species account for a large proportion in the northeast forest area of China, accounting for 15%-20% of the forest land. The operation of these Mongolian oak forests improves the forest resources and improves the forest land utilization rate in the northeast forest areas. Improving the environmental quality of the region is of great significance [5, 6].

## 2. Materials and Methods

### 2.1. Sample Collection and Determination of Elemental Content

In this experiment, three annual seedlings of Quercus mongolica, three seedlings of Quercus mongolica and three strains of American red dragonfly were selected as test materials. The tested materials were all well-grown, pest-free seedlings in the Houshan Teaching and Research Base of Shenyang Agricultural University. One year old Mongolian oak seedlings are about 15 cm, two-year-old Mongolian oak seedlings are about 30 cm, and American red dragonfly is about 3 meters.

### 2.2. Determination of Wild Hyperspectral Data

On May 31, 2018, in the Houshan nursery of Shenyang Agricultural University, three well-growing, disease-free leaves were selected from three annual Mongolian alfalfa and three biennial Mongolian alfalfa. Three of the three American red dragonfly were selected. Slices of good-growing, disease-free red leaves and 3 well-grown, disease-free green leaves, measured from 8 am until 6 pm, during which time the Li-6400XT portable photosynthesis analyzer was used every 2 hours. The 12 functional blades were measured once, and the values were taken 3 times for each measurement, and the average value of the 3 values was recorded, and the data was processed later. The measured indicators of this test include: net photosynthetic rate (Pn), stomatal conductance (Cond), intercellular CO2 concentration (Ci), transpiration rate (Tr) according to Fischer RA method, plant leaf instantaneous water use efficiency (WUE) This formula can be calculated using WUE=Pn/Tr.

## 3. Results and Discussion

### 3.1. Diurnal Variation of Net Photosynthetic Rate (Pn) of Leaves

It can be seen from Fig. 1 that the net photosynthetic rate of H. sinensis is higher than the net photosynthetic rate of Quercus mongolica. The diurnal variation of net photosynthetic rate of Quercus mongolica seedlings is not significant, indicating that the change of light intensity is net to Quercus mongolica seedlings. The photosynthetic rate had a small effect. During the period from 8:00 to 10:00, the net photosynthetic rate of the two-year-old Quercus mongolica

leaves and the American red oak leaves slowly increased, while the net photosynthetic rate of the annual Mongolian oak leaves and the American red oak green leaves decreased slowly.

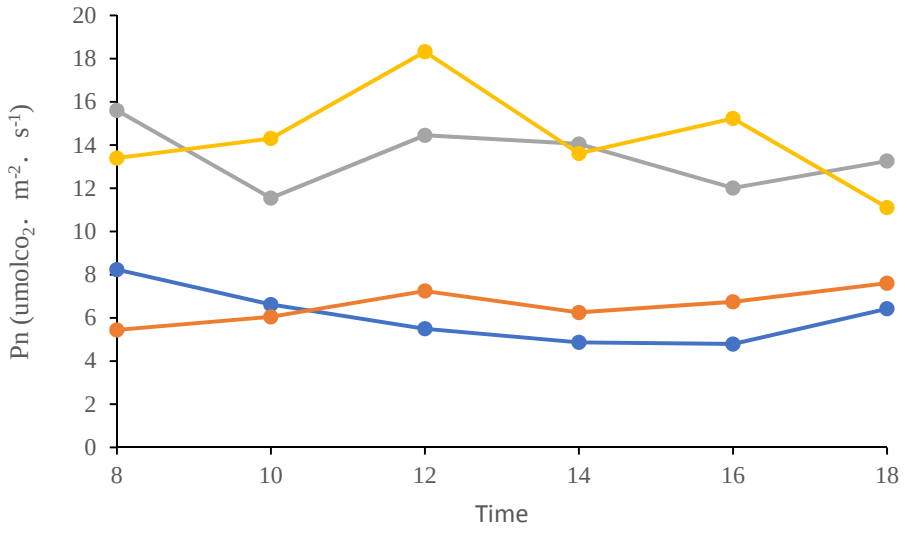


**Fig 1.** Diurnal variation line diagram of leaf photosynthetic rate (Pn)

## 3.2. Diurnal Variation of Leaf Transpiration Rate (Tr)

The transpiration rate refers to the amount of water transpiration per plant area in a certain period of time. Transpiration plays an important role in the growth and development of plants. It can reduce the temperature of leaves and promote the assimilation of CO2. Therefore, the transpiration rate of plants is studied. Very necessary. By observing Figure 4, we can see that the transpiration rate of red sapphire leaves and the transpiration rate of red saplings in the United States are significantly higher than the transpiration rate of annual leaves of Quercus mongolica and the transpiration rate of leaves of two-year-old Quercus mongolica.

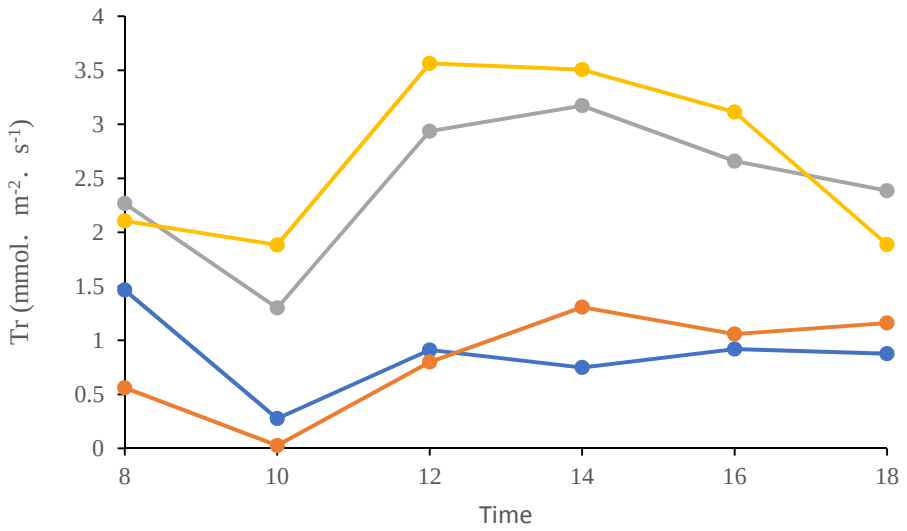


**Fig 2.** Diurnal variation line diagram of leaf transpiration rate (Tr)

## 4. Conclusion

The transpiration of plants is closely related to their net photosynthetic rate. Water use efficiency is a comprehensive reflection of plant photosynthesis and transpiration

characteristics, and its size can reflect the plant's ability to adapt to adversity. From the results of this study, the photosynthesis rate, transpiration rate, and stomatal conductance of the leaves of the Mongolian oak and the two-year-old Quercus mongolica were lower than the photosynthesis rate of the American red and red leaves. The transpiration rate and stomatal conductance, while the water use efficiency of the annual leaves of Quercus mongolica and the leaves of the two-year-old Quercus mongolica are above the water use efficiency of the red leaves and the red leaves of the United States, and the annual Mongolian oak leaves are around 10 am. The water use efficiency of the leaves of the two-year-old Quercus mongolica was significantly higher than other times. Through comparison and analysis, the water use efficiency of the leaves is positively correlated with the specific leaf area of the leaves. The greater the leaf area, the greater the water use efficiency, and the specific leaf area of the leaves of Mongolian oak is greater than the specific leaf area of the American red dragonfly. The specific leaf area of the two-year-old Quercus mongolica is larger than the specific leaf area of the annual Mongolian oak, and their water use efficiency also shows such a pattern.

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