Study on Water Use Efficiency in Plant Photosynthesis and Transpiration Characteristics

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Abstract: The mites are a very important genus in broad-leaved trees. Some species of genus occupy a very important position in temperate coniferous and broad-leaved mixed forests, warm temperate deciduous broad-leaved forests and subtropical evergreen broad-leaved forests. Quercus mongolica is an important species of temperate coniferous and broad-leaved mixed forest and temperate deciduous broad-leaved forest. In these areas, the management and utilization of this species is of great significance for obtaining better economic and ecological benefits. Especially in the vast temperate and temperate mountainous areas, due to the influence of natural and human factors, there is a general trend of aridification and thinning. Therefore, the protection and restoration of vegetation here becomes an intractable problem, but it must be solved. problem. Quercus mongolica and American red dragonfly are very drought-tolerant, thin-tolerant, and highly adaptable tree species. They can form forests on arid, sunny slopes where other tree species are difficult to survive, and play a role in maintaining water and soil and conserving water sources. Therefore, in the arid mountainous areas, Mongolian ridges and American red crickets should be developed as important afforestation species. In this experiment, annual photosynthetic rate (Pn), transpiration rate (Tr), water use efficiency (WUE), stomatal conductance (Cond) were measured at the leaf level using annual Mongolian oak, two-
year-old Mongolian oak and American red dragonfly as test materials. Intercellular CO2 concentration (Ci), calculate the specific leaf area and make a correlation analysis.

**Keywords:** Specific leaf area, Water use efficiency, Ecological Benefits.

### 1. Introduction

There are many factors affecting water use efficiency, which can be divided into external factors and internal factors. There are many external factors affecting the water use efficiency of plants, such as light, water [1], air temperature, leaf temperature, saturation difference [2], CO2 concentration [3], drought, freezing, cooling [4], etc. Water use efficiency has an impact, but the degree of impact is different. It believe that the three most important factors affecting water use efficiency are air temperature, leaf temperature and saturation difference [5], while that the main factors affecting plant water use efficiency are light and moisture. There are many studies that agree with Farquhar's conclusions. For example, Nada research suggests that the main determinant of plant water use efficiency is water conditions [6].

The results of Morecroft and Woodward show that the water use efficiency of plants can be improved by means of cooling, drought and freezing, and the water use efficiency of plants can be reduced by decompression and sprinkler irrigation. Jiang Gaoming and others believe that the main factor affecting the water use efficiency of plants is CO2 concentration. The higher the CO2 concentration, the higher the plant water use efficiency.

### 2. Mechanical Analysis

In the test site, the annual growth of the Mongolian oak, the biennial Mongolian oak and the American red dragonfly with no pests and diseases were selected. The samples were taken on the same day, taking 25 pieces of annual Mongolian oak leaves, 25 pieces of biennial Mongolian oak leaves, and 25 pieces of American red oak leaves. And 25 pieces of American red eucalyptus green leaves were immediately put into plastic bags after being taken, sealed and brought back into the room, and the outlines of the leaves were drawn on the grid paper and their leaf areas were recorded. It was dried at 85 °C for 3 h, and the dry weight was weighed and recorded. The specific leaf area was calculated and compared with the water use efficiency of the four types of leaves.

### 3. Data Collection by Questionnaire Survey

By observing Fig.1 and 2, we can conclude that the water use efficiency of the leaves
is positively correlated with the specific leaf area of the leaves. The larger the specific leaf area of the leaves, the greater the water use efficiency of the leaves. The specific leaf area of the leaves of Quercus mongolica was higher than that of the American red dragonfly. The ratio of the specific leaf area of the leaves of the two-year-old Quercus mongolica was larger than that of the annual leaf area of the Mongolian oak.

![Figure 1. Ratio of leaf area to leaf dry weight](image1)

![Figure 2. Trend map of specific leaf area and water use efficiency of leaves](image2)

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 red and yellow leaves of the American red sorghum. 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.

References