

Features Of Water Exchange In Various Lycium L. Family Species Under Introduction Conditions

R.A. Eshmuratov¹, A.K. Yuldasheva²

¹Candidate of Biological Sciences, Associate Professor, Nukus State Pedagogical Institute named after Ajiniyaz, Nukus City, Karakalpakstan.

E-mail: R.Eshmuratov@mail.ru

²PhD Student, Nukus State Pedagogical Institute named after Ajiniyaz, Nukus City, Karakalpakstan.

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Abstract

In recent years, there has been a large-scale implementation of the rational use of medicinal herbs and plant introduction. Priority was given to introducing wild medicinal plants in accordance with the Presidential Decree of November 26, 2020, "On Measures to Expand the Scope of Scientific Research on the Cultivation and Processing of Medicinal Plants and the Development of Their Seed Production" [1].

Keywords: Lycium Barbarum and Lycium Chinense, Human Body, Raw Ingredients, Microclonal, Lycium Family.

INTRODUCTION

Plants have long been used as food by animals and as both food and medicine by humans. Traditional medicine employed a variety of tinctures and ointments made from curative plants. Therefore, due to advancements in science and technology, pharmaceutical formulations derived from plants have a benign impact on the human body. Currently, raw ingredients derived from medicinal plants serve as the foundation for the majority of medicines. The examination of the chemical makeup of nutritive and therapeutic plants, as well as the cultivation, introduction, and scientifically supported culture of rare potential species growing in natural conditions, are therefore of enormous practical significance [3].

A portion of the population's demand for medicinal plants is met by the introduction of new species, which increases the biodiversity of our local environment. These introducers include *Lycium barbarum* and *Lycium chinense* plants, both of which are well-known in foreign folk medicine and are members of the *Lycium L.* family and the *Solanaceae* family.

Kirill Tkachenko studied *Lycium barbarum* and *Lycium chinense* plants and discovered that they grow primarily in the center of China and various species have been grown in the "Botanical" Garden in St. Petersburg since the end of the XVIII century and also their seedlings are kept both in greenhouses and in the open ground, and it is frequently mentioned that it was planted on the yards. He also underlines that Chinese goji may grow in any soil, but they must be in the open because they cannot accept shade, and they can live anywhere between 10 and 35 years [8].

THE MAIN FINDINGS AND RESULTS

Moldovan scientist Maria Tabara, a doctor of biological sciences and her doctoral dissertation on the topic of "Development and microclonal reproduction of *Lycium barbarum*" stated about the genus *Lycium* and she was the first to propose *Lycium barbarum* reproduction in the Moldavian Republic through efficient methods and methods of micropropagation to obtain uncontaminated and homogenous material for reproduction. Maria Tabara stated that *Lycium barbarum* is a new species in the nation and its unique traits and cultivation techniques have not yet undergone sufficient study and therefore, it is appropriate to breed this species because the fresh fruits of this bush have significant health advantages that meals digest quickly, and are most importantly a useful addition for the diet [7].

Researchers from the Russian Federation examined the polar lipids in the fruits of *Lycium barbarum* for their fatty acid content [8].

With the creation of the Central Asian State University Botanical Garden in 1924, the task of introducing medicinal plants in our republic started on a regular basis and developed quickly after World War II. For the introduction of herbal plants,

particularly medicinal plants, research on how plant growth, development, and productivity depend on environmental circumstances and how they adapt to a new environment. [3].

The world of plants is undergoing significant changes as a result of ecological changes on the territory of the Republic of Karakalpakstan. Therefore, it is quite practical to introduce new plant species to this region.

Lycium family species have not been investigated in any way under Karakalpakstan environment. Therefore, it is crucial to research the bioecological and physiological traits of species of the genus under various introduction settings and use them in the pharmaceutical industry.

RESEARCH METHODS

Utilizing the tools on the base of Karakalpak State University "Bioecology" laboratory, we conducted our experiment to better understand the physiological functions of the experimental objects, particularly the characteristics of water exchange in plants.

Field experiments were carried out at the experimental land of Forestry of Nukus district. The trials were conducted in a small field setting with 3 replications: 3 counted rows, 10 counted plants. The cleanliness, germination, and other indicators of the researched plants' seeds were assessed in the lab prior to their germination in the experimental field.

It was investigated how plants exchange water, using the key markers. Weighing the leaves seven times per day allowed researchers to establish how much water was there [Baslavskaya]. By using the quick draw method on an electronic scale, the rate of water evaporation from the leaves was also calculated [5]. Five times a day, every three hours from 8 am to 8 pm, the rate of transpiration was measured three times. Before removing each leaf, the air's temperature and relative humidity were measured with an Asman psychrometer. The Chatsky method [9] was used to calculate the water deficit compared to the saturation point of the leaves. During the season, this calculation was done three times a day at 8, 13, and 18 hours using the Stocker [10] formula. Plant leaves' ability to retain water A.A. It was determined using the Nichiporovich method [6].

To understand a plant's bioecological traits, physiological adaptability to different environmental conditions, and to boost productivity, water exchange in plants must be studied [4].

THE MAIN PART

There is no information in the scientific literature about the properties of water exchange in members of the *Lycium* family. The key indices of water exchange, including transpiration rate, water content in leaves, water deficit, and water storage capacity, were examined two species of the *Lycium* family: *L. barbarum* and *L. chinense*, under various introduction conditions in 2020-2022.

TRANSPIRATION RATE

Life in plants depends on transpiration. The flow of water and other water-soluble materials throughout the body of the plant as well as gas exchange depend on transpiration for proper control of leaf temperature. It was discovered that the rate of transpiration in the tested species of *Lycium* varied throughout the day and the period when the plants were in full growth (Table 1).

Table 1. Transpiration rates vary during the day and during specific seasons (in mg/g/s) in *L. barbarum* and *L. chinense* under Nukus circumstances

Plant	Weight in every 2 hours						
	8 00	1000	12 00	14 00	16 00	18 00	20 00
April							
<i>Lycium barbarum</i>	1029,19	1529,21	1873,9	1172,38	2536,8	1538,4	1076,84
<i>Lycium chinense</i>	1228,96	1883,59	2856,6	1617,7	2435,86	1067,39	1779,5
May							
<i>Lycium barbarum</i>	627,8	401,3	782,9	617,3	868,7	968,02	919,4
<i>Lycium chinense</i>	531,3	927,3	796,07	799,23	776,05	930,55	684,17
June							
<i>Lycium barbarum</i>	1488,6	1245,09	415,59	807,71	836,84	885,78	305,39
<i>Lycium chinense</i>	885,5	967,1	648,9	1129,9	629,1	952,3	1340,1

AMOUNT OF WATER

The amount of water in plants is one of the primary indications of their water exchange mechanisms and is influenced by the plant's ontogenesis, genotype, and growth circumstances. The majority of a plant's life processes involve water, either directly or indirectly. Every metabolic process happens in an aqueous medium. The amount of water in various plants varies depending on the tissue type, age, and physiological state of the plant. It also varies depending on the season and time of day. Consequently, it was investigated how the water content of the leaves of two species of the genus *Lycium* changed in the Republic of Karakalpakstan (Table 2).

Table 2. Amount of water * (% of wet mass) in leaves of *L. barbarum* and *L. chinense* under conditions of Karakalpakstan.

Plant	Weight of a leaf						
	8 00	1000	12 00	14 00	16 00	18 00	20 00
April							
<i>Lycium barbarum</i>	90,3	87,3	86,6	87	87	86,9	88,3
<i>Lycium chinense</i>	87,6	89,2	79,3	89,3	86,5	87,3	87,3
May							
<i>Lycium barbarum</i>	86,5	88	86,8	86,7	85,5	83,3	86,03
<i>Lycium chinense</i>	87,1	85,7	84,7	86,8	87,8	84,9	82,3
June							
<i>Lycium barbarum</i>	94,1	91,6	94,3	94,2	92,6	92,6	94,1
<i>Lycium chinense</i>	92,2	90,8	90,5	89,8	93,8	97,1	92,7

WATER SHORTAGE

Photosynthesis, the primary physiological function in the plant organism, and water deficiency are intimately associated [4].

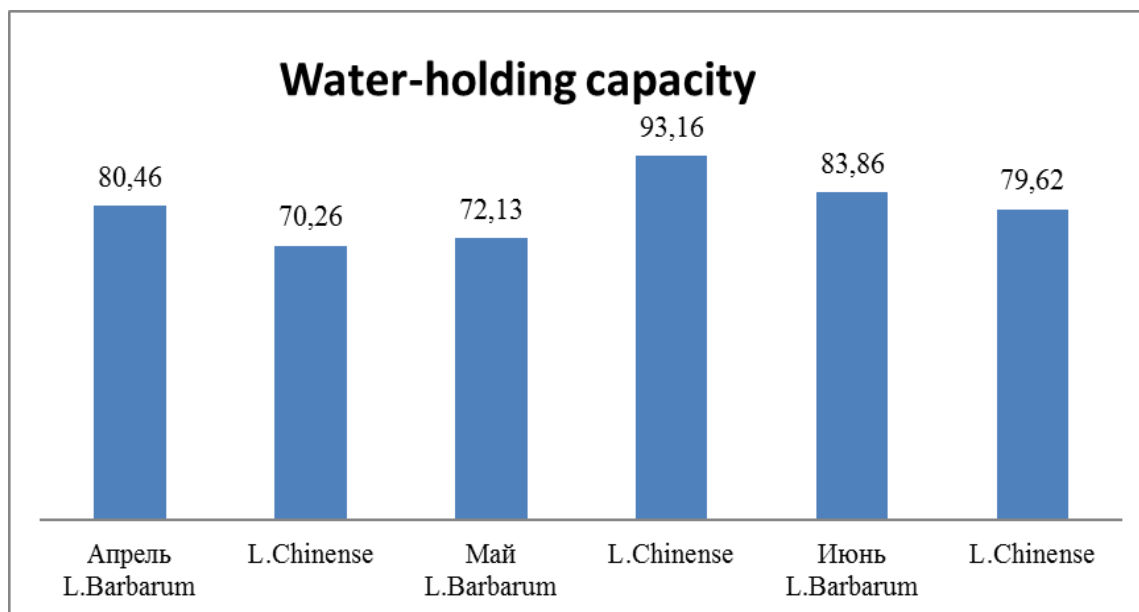
The daily average indicators of water deficit in the Republic of Karakalpakstan were established when we investigated the water deficit in the leaves of *Lycium* species grown there (Table 3).

Table 3. Water shortage in *L. barbarum* and *L. chinense* species under Karakalpakstan circumstances varies daily and seasonally (in % relative to full saturation)

Plant	Calculating the plant's water shortage		
	8 00	14 00	18 00
April			
<i>Lycium barbarum</i>	8,7	14,4	17
<i>Lycium chinense</i>	8,13	10	13,9
May			
<i>Lycium barbarum</i>	19,4	20,3	14,6
<i>Lycium chinense</i>	14,3	18,2	17,5
June			
<i>Lycium barbarum</i>	11,8	12,2	14,3
<i>Lycium chinense</i>	18,3	9,8	13,2

WATER-HOLDING CAPACITY

The identification of drought-tolerant species depends on the ability of plant leaves to retain water. Because of this, the conditions in Karakalpakstan were tested to see how well *Lycium* species' leaves retained water.



CONCLUSION

As a result, it was discovered that the water exchange indicators of the 2 species' investigated leaves varied. It was discovered that these variations rely on the biological traits of the species under study. The following conclusions can be gleaned from understanding the features of water exchange in Lycium species.

- Compared to *L. chinense*, it was found that *L. barbarum* transpires at a faster rate in the morning and a slower rate in the afternoon.
- Both species use different amounts of water at different times of the year; however, *L. barbarum* uses more water at the end of the growing season.
- *L. barbarum* has a greater water shortage than *L. chinense*.
- It was discovered that *L. barbarum* has a higher water retention capacity than *L. chinense* at the beginning and end of the vegetation period and a lower capacity toward the middle.
- It was discovered that the indicators of the water exchange process change throughout the vegetation period depending on the type of plants (biological characteristics) and climatic conditions.

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