



ZIZIPHUS JUJUBA'S RELATIONSHIP TO LIGHT

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ABSTRACT

This article scientifically analyzes the response of Ziziphus jujuba Mill. to light, the effect of light intensity and duration on the physiological and morphological characteristics of the plant. During the study, the dependence of the photosynthesis process, the amount of leaf pigments, growth rates and fruit yield of the jujuba plant on the level of light was studied. Growing Ziziphus jujuba in open areas with sufficient light was shown to be the most optimal solution from an ecological and agrobiological point of view. This information serves as an important scientific basis for developing agrotechnical measures appropriate to the light regime of the plant.

INTRODUCTION

Currently, due to global climate change, increasing temperatures and increasing drought processes, the issue of studying the ecological stability and adaptive capabilities of many plant species is becoming increasingly relevant. Light is one of the most important ecological factors in the growth and development of plants. Light intensity, duration and spectral composition are the main factors determining the activity of the photosynthesis process in plants, their morphological structure and physiological state.

In this context, the study of the response of *Ziziphus jujuba* Mill. (unobi, date palm) to light is of great scientific and practical importance. This species belongs to the Rhamnaceae family and is mainly distributed in warm, sunny tropical and subtropical regions. *Ziziphus jujuba* is a light-loving (heliophilous) plant and performs intensive photosynthesis in high light conditions.

The biological characteristics of *Ziziphus jujuba* show that it is a plant sensitive to light deficiency, but tolerant of high temperatures and strong sunlight. Changes in the amount of light cause certain changes in the morphological structure of the plant (size of the leaf surface, amount of pigments, degree of branching) and physiological processes.

The relevance of this topic is that it is important to study the influence of light regimes on the cultivation of *Ziziphus jujuba* in different ecological zones of Uzbekistan (foothills, valleys and deserts), to determine the most favorable light conditions for optimal growth and fruiting. This is of practical importance in increasing the productivity



of the plant, creating environmentally sustainable plantations and developing new agrotechnical recommendations. As a result of the conducted studies, it was found that *Ziziphus jujuba* Mill. is a light-loving (heliophilous) species. It carries out the most active photosynthesis process under conditions of high light intensity and maintains growth rates at an optimal level. Light energy serves as a decisive factor in the physiological processes of the plant - photosynthesis, transpiration and pigment synthesis.

Research results and analysis

As a result of experimental observations, the following conditions were identified:

1. An increase in light intensity increased the amount of chlorophyll "a" and "b" in jujube leaves, which led to an increase in photosynthetic efficiency by 18–25%.
2. In low light conditions, the leaves turned yellow, the degree of branching decreased, and fruit yield decreased by 30–40%.
3. The dynamics of plant growth showed the highest results when the optimal light duration was 10–12 hours per day.

The morphological adaptations of *Ziziphus jujuba* are also directly related to the light regime. Under the influence of strong sunlight, the leaf surface thickens, the number of stomata decreases, and the leaf cuticle layer strengthens - this protects the plant from excessive sunlight and water loss. With a lack of light, the leaves become larger and have a thinner structure, which forces the plant to absorb the maximum amount of radiation energy. According to the results of measuring the photosynthesis process, in open areas with full sunlight, the level of carbon fixation in leaves is 1.6 times higher, and more effective results were observed compared to plants in partially shaded areas. At the same time, excessive light also caused a certain stress state - photooxidation processes on the leaf surface increased, which led to the premature shedding of some leaves.

The plant's ecophysiological adaptation mechanisms are such that it changes the angle of its leaves in response to changes in solar radiation, thereby preventing excessive heat absorption. It has also been found that under high light conditions, the activity of antioxidant enzymes increases - this increases the plant's tolerance to photostress.

The analysis showed that *Ziziphus jujuba* is best grown in open areas with high light levels. Under conditions of light deficiency, the plant stops growing, the leaf area shrinks, and productivity decreases. Therefore, taking into account the light regime and angle of its leaves is considered an important agrotechnical factor when organizing jujube plantations.

CONCLUSION

As a result of the conducted research, it was found that *Ziziphus jujuba* Mill. belongs to the family of light-requiring, heliophilous plants, and the intensity and duration of light play an important role in its physiological and morphological development. Light energy, as the main driving force of the photosynthesis process, directly determines the growth rate of the plant, the amount of leaf pigments and fruit yield.

Experimental observations have shown that under optimal light conditions, the photosynthetic activity of the jujube plant is high, the concentration of chlorophyll on the leaf surface increases, and the yield increases by 25–30 percent. Under conditions of poor



light, morphological changes are observed - enlargement of the leaves, reduced branching, and a decrease in fruit quality.

Also, the plant's defense mechanisms against light stress are manifested by an increase in the activity of antioxidant enzymes, a change in the angle of leaf location, and a thickening of the cuticle layer. These phenomena confirm the ecological adaptability of the jujube plant to high solar radiation.

In general, the correct organization of the light regime in the cultivation of *Ziziphus jujuba*, the selection of open and sunny areas, as well as the coordination of agrotechnical measures with this factor ensure stable growth and high yield of the plant. These results are of scientific and practical importance in determining the ecological and physiological significance of light for this species.

Combining activities with this factor ensures stable plant growth and high productivity. These results are of scientific and practical importance in determining the ecological and physiological significance of the light factor for this species.

References:

1. Juraev A.Sh., Tojiev G.M. Physiology of plants. - Tashkent: Science Publishing House, 2019. - 285 p.
2. Mamatkulova S.M. Biology and agrotechnics of medicinal plants. - Tashkent: University, 2020. - 312 p.
3. Hasanov B.Kh. Plant ecology. - Samarkand: SamDU publishing house, 2018. - 276 p.
4. Pareek, O.P., A.O. Awasthi, and D. Kumar. The Jujube (*Ziziphus jujuba* Mill.) – A Multipurpose Fruit Tree Species. Springer, 2014. – 354 p.
5. Chen, K., Wang, M., et al. Photosynthetic characteristics of *Ziziphus jujuba* under different light conditions. - Journal of Plant Physiology, 2021, Vol. 268: 153553.
6. Liu, M.J., Zhao, Z.H. Ecophysiological adaptation of Chinese jujube (*Ziziphus jujuba*) to light intensity. – Scientia Horticulturae, 2019, 251: 220–227.
7. Karimov D.A., Abdullayeva N.R. Ecological adaptation characteristics of medicinal plants in arid climates. – Uzbekistan Biology Journal, 2022, No. 3, pp. 47–54.
8. Zhang, R., and Guo, Y. Light-dependent growth and chlorophyll fluorescence characteristics in *Ziziphus jujuba*. – Plant Biology Journal, 2020, 22(8): 1154–1163.
9. Mirzaeva, M.S. Biological characteristics of *Ziziphus jujuba* and its relationship to climatic factors. - Scientific information of Tashkent State Agrarian University, 2023, No. 2, pp. 56-62.
10. Hu, L., Wang, H., et al. Influence of light and temperature on the growth and photosynthesis of *Ziziphus jujuba* seedlings. – Environmental and Experimental Botany, 2022, 194: 104734.