Bioecology, landscape use, and breeding technology of *ephalotaxus drupacea sieb*. Et zucc.

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Abstract. According to the UN Convention on Biological Diversity, 34,000 plant species are in danger of going extinct. Environmental issues including climate change provide difficulties for landscaping, plant selection, and environment aesthetics. In addition to employing landscape trees, adding lovely blooming shrubs may improve the landscaping's aesthetic value. In this article Cephalotaxus drupacea Sieb. et Zucc. The bioecology, decorativeness and breeding technology of Danakbosh zarnab are discussed, as well as practical experiences. The results of studying the morphobiological characteristics of Cephalotaxus drupacea seeds are presented. It has been shown that the size, shape, and texture of the seeds serve as a diagnostic feature. These features of Cephalotaxus drupacea indicate a high level of adaptation to environmental factors. It is an evergreen ornamental shrub, 10-15 m tall, belonging to the Cephalotaxaceae family. Homeland - Central China, Korea, East India, Japan. Shade-loving, cold-resistant. According to AL Takhtadjian, Cephalotaxaceae family, Cephalotaxus genus consists of 6 species, which were widespread in the Northern Hemisphere in ancient geological times. Currently, this species is distributed only in Asia, namely: East India, Central and South China, Taiwan Islands, Korea and Japan.

1 Introduction

The world's urban population is growing rapidly, with 50% currently living in cities and this number expected to reach 66% by 2050 [1-4]. As a result, there is a need to improve urban infrastructure and use ornamental plants that can thrive in urban environments. Despite 3.2 million hectares of forest in the country, which is 7% of the total area, only 821 thousand hectares are cultivated forests, meaning that only 2% of the country's territory is covered with forests. Planting and cultivating various ornamental shrubs is important for the natural reproduction of forests, as natural forests are rare in the country [5-9]. The UN Convention on Biological Diversity has identified 34,000 plant species that are under threat of extinction. Environmental problems, such as climate change, pose challenges to landscaping, plant selection, and creating an aesthetically pleasing environment. In addition to using landscape trees, incorporating beautiful flowering shrubs can enhance the aesthetic value of landscaping [7-11].

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The State Forestry Committee of Uzbekistan is placing a significant emphasis on developing scientific knowledge and innovative techniques for cultivating ornamental plant seedlings. It is currently considered necessary to enhance the bio-ecological characteristics of ornamental plants that can grow in Uzbekistan and improve the breeding methods for these plants. The Republic of Uzbekistan's Strategy of Actions for 2017-2021 identifies the optimization of arable land and crop composition in agriculture, implementation of advanced agro-technologies, and productivity increase as important strategic objectives [1]. Therefore, it is essential to research and understand the bio-ecological characteristics of promising ornamental plants suitable for growth in Uzbekistan, investigate the factors that influence them, and advance breeding methods for landscaping purposes [11-15].

2 Methods and materials

The State Forestry Committee of Uzbekistan is focusing on developing scientific knowledge and innovative techniques to cultivate ornamental plant seedlings. Currently, there is a pressing need to enhance the bio-ecological characteristics and breeding methods of ornamental plants that can thrive in Uzbekistan [1-5, 15-18]. One such plant is an evergreen ornamental shrub from the Cephalotaxaceae family, which can grow up to 10-15 meters tall and is native to Central China, Korea, East India, and Japan. This plant prefers shaded areas and can tolerate cold temperatures [14-17].

The Cephalotaxaceae family, which includes the Cephalotaxus genus, had six species that were widespread in the Northern Hemisphere in ancient times. However, currently, these species are only found in Asia, including East India, Central and South China, Taiwan Islands, Korea, and Japan. The Cephalotaxus species typically grow in humid and warm shaded mountains, at elevations ranging from 300 to 3300 meters above sea level, mixed with other forest trees. In 1955, during a visit to the Tashkent Botanical Garden, an introduction was made to the Cephalotaxus species [4-7]. The family's species are known for their rich alkaloid composition, which has been widely studied by foreign researchers. Around the world, there is a significant amount of scientific research focused on improving the bioecological properties and breeding techniques of ornamental and landscaping plants. Various scientists have conducted research on the introduction and cultivation of landscape plants, and their work has been utilized in landscaping. Zarnab grows well, mainly in shade and semi-shade, forming a second layer under trees. Shade-tolerant, shade-loving [1-7].

3 Results and Discussion

The results showed that the studied species had a branch with a gray bark. The leaves were dark green, arranged in opposite pairs, thin, long, pointed at the tip, the upper side was slightly shiny, 2-3.5 mm wide, 18-45 mm long. Seeds were oval, 2-3 cm long, and 1.8-2 cm wide. This species produces seed domes that form in one year and continue until the end of the vegetation period, while the seed fruits are pollinated in the next year's vegetation period and mature in the second decade of August. It was reported that in 2022, under introduction conditions, the weight of 1000 seeds was 432 grams. The buds of this species awaken in early March (March 1), and the buds open in mid-March (March 14). The emergence of seed flowers is observed at the end of March (March 27).

The division of conifers occurs in early April (April 1), and the divorce process takes place on April 6. The growth of branches stops in early June (June 7), and new winter shoots emerge at the beginning of June (June 9). The state after seeding is observed in the first decade of June (June 10). The seeds of this species mainly ripen in autumn, and they

are light brownish-red in color. The upper part of the tree has the most seeds, the middle part has fewer, and the lower part has very few, almost none.

Based on long-term data, the relative humidity of the air remains normal throughout the year. The lowest relative humidity occurs in July, which is the hottest month, and is at 40%, while the highest relative humidity of 72% occurs in January. During the months of March and April, when almond seeds germinate and sprouts begin to form, the relative humidity of the air remains within an acceptable range of 61-66% (Fig. 1).

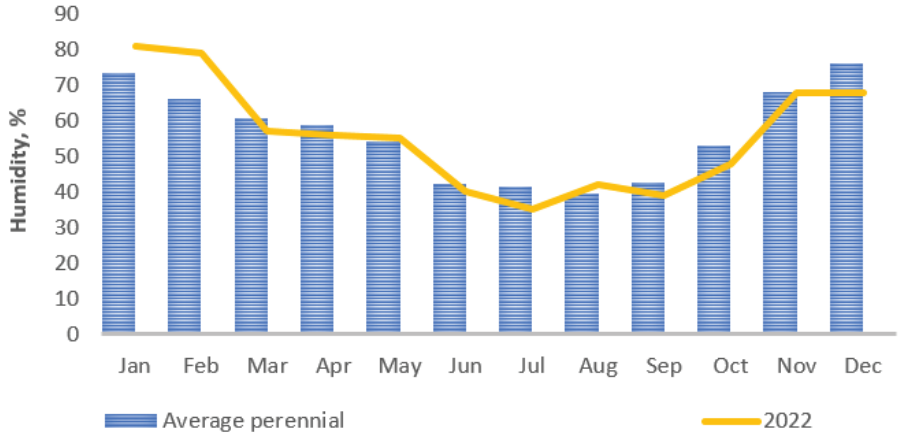

Fig. 1. Relative air humidity, %.

In August and early September, the seeds of this species start to turn brown and ripen from the second decade of September. Ripe seeds fall out easily and can be separated from the shell without much effort. To increase the number of seed-bearing mother bushes of this species, it is necessary to cultivate more of them. Currently, several mother bushes of this species are growing well and producing fruit in the Tashkent Botanical Garden. In our climate, Cephalotaxus drupacea usually produces a bountiful harvest every three to four years, with the fruit reaching 4-5 points on a five-point scale. The pollination period lasts for 5-8 days in early March and early April, especially during dry and hot weather. However, rain and severe cold can slightly delay the pollination process in these trees.

It was found that the amount of humus in the Khaydov layer was 1.7%., which decreases downwards. However, the amount of total nitrogen in the soil layer was 0.12%, and it decreased as it went down to a depth of 105-150 cm. The amount of total phosphorus was 0.13% in Khaydov layer and decreased to 0.08% as it falls to 105-150 cm (Table 1).

Table 1. Soil agrochemical composition of the experimental site.

Thickness cm	Gross Nitrogen %	Phosphorus		Potassium	
		Gross %	1kg in motion	Gross %	On the move
0-10	0.119	0.135	32.1	2.3	27.0
10-20	0.101	0.140	33.6	2.8	3.05
20-30	0.87	0.099	28.6	2.1	38.7

30-40	0.78	0.083	28.9	1.7	25.2
40-50	0.05	0.052	18.3	12	23.5

The following information was gathered on Cephalotaxus drupacea bushes growing in different light conditions in the Tashkent Botanical Garden. In semi-shaded areas, there were 46-220 seed-bearing maternal domes, with seed-bearing lateral branches measuring 9.7-13.4 cm, and 9-10 generative branches, each with 6-12 seed pods. The total height of the tree ranged from 1.72-3 m, with a main stem measuring 4.4-6.3 cm and a root neck of 3.8-5.6 cm. A single tree can yield 8-9 fully ripe fruits. The leaves of the tree are light green in color.

In shaded areas, Cephalotaxus drupacea was up to 16-27 seed-producing mother domes and seed-producing lateral branches measuring 8.3-34.6 cm. Generative branches are also present, as are seed domes. The total height of the tree can reach 1.80-3 m, with a main branch of up to 18-21 cm and a root throat of 3.5-7.6 cm. Furthermore, there can be 1-2 fully ripe fruits on the tree. The leaves of the tree are dark green in color, and all bushes grown in shade have well-developed branches and side branches at the root neck. In sunnier areas, there are 22-136 seed-forming mother domes, with pollinator (male) bushes measuring 11-21 cm and having a large number of branches. Domes are mainly formed in the upper part of the tree, and the total height of a 14-year-old tree is 1.20-1.35 cm.

The tree's main branch measured 16-19 cm while the root throat measured 1.3-6.6 cm. The leaves of the tree turned yellow due to exposure to sunlight. Seedlings grown in shade performed well and had slightly yellow leaves with a dark green color. The tree trunk slightly tilted towards the side where there was more shade. Pollinators appeared on fifteen-year-old seedlings. Six-year-old seedlings grown in full sun measured 36 cm in height, with partially yellowed tips of the annual leaves. The tree was not affected by diseases or pests. Seedlings grown in the sun had more branches of the second order than the root neck. The mother trees produced fruit every year and were in good condition. Cephalotaxus drupacea produced seeds mainly in autumn, with reddish-brown seeds when ripe. The seeds were mainly produced in the upper part of the tree and very few in the middle and lower branches. The seeds started turning brown in late August and ripened from the second half of September, with a reddish-brown color.

Those trees or shrubs could reach up to 15 meters in height and had gray bark with longitudinal stripes. The small ovoid buds had tightly folded backs and triangular scales at their base. The leaves were leathery, linear, dark green, and abruptly pointed at the apex with a hard tip. They gradually tapered to the base and had 12-15 rows of stomata on each side, arising from two-rowed, V-shaped buds (Fig. 2). Studying the morphology of seeds and fruits of various taxa was useful for resolving taxonomy and phylogeny debates. However, the morphology of the fruit of Cephalotaxus drupacea and its family was still insufficiently studied, causing controversy over determining the type of fruit they produce. Morphological study of gymnosperm fruit skin was both practically and theoretically interesting.

White pine bark produced one seed per cone, occasionally two or three seeds, which ripened in the fall of the flowering year. The mature seeds resembled angiosperm fruits, with elliptical-shaped brown-green fruit pulp. The yellowish or light brown bark was lightweight and did not split internally or externally, with resin-free channels. The mechanical composition was similar to wood. The morphological indicators of the seeds and fruits of each species of white pine bark were different, but their importance in systematics was increasing due to their relatively constant type. Cephalotaxus drupacea was an evergreen tree or shrub that grew up to 10-15 meters tall, with opposite branches in a heap and green and white bark. The thick-skinned leaves were arranged spirally in two

rows on the side branches, with a clear vein in the middle and two white veins at the bottom. They were dark green and fell at four or five years of age. Microstrobils were short-legged with a complex spherical rosette and located on annual branches. Megastrobili were located in the axils of 1-3 rounded leaves and collected in small cones at the tips. Cephalotaxus drupacea was dioecious, sometimes monoecious.

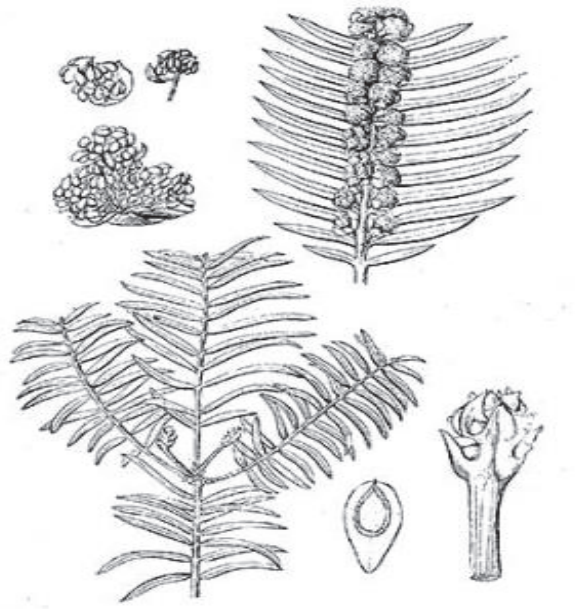

Fig. 2. Cephalotaxus drupacea Sieb. et Zucc.

4 Conclusion

The Cephalotaxus drupacea plant grows well in shade and semi-shade, and seedlings are thriving in the Botanic Garden. Multiple mother trees are producing fruit, allowing for experiments and the growth of more seedlings. To increase the number of mother trees producing seeds, this plant is recommended for beautification and greening projects. Planting five-year-old or older seedlings will yield the best results.

It was found that the amount of humus in the Khaydov layer was 1.7%., which decreases downwards. However, the amount of total nitrogen in the soil layer was 0.12%, and it decreased as it went down to a depth of 105-150 cm.

It was observed that in semi-shaded areas, there were 46-220 seed-bearing maternal domes, with seed-bearing lateral branches measuring 9.7-13.4 cm, and 9-10 generative branches, each with 6-12 seed pods. The total height of the tree ranged from 1.72-3 m, with a main stem measuring 4.4-6.3 cm and a root neck of 3.8-5.6 cm.

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