

## Section 1. Biology

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### BOTANICAL AND MORPHOLOGICAL CHARACTERISTICS OF *POPULUS PRUINOSA*

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#### Abstract

The article presents a scientific study of the botanical and morphological characteristics of the blue poplar, a tree species growing in Karakalpakstan. A detailed description of the leaves, flowers, bark, shoots, root system and general appearance of the tree is given. Phenological stages such as budding, flowering and leaf fall are clearly defined. Both natural and vegetative methods of reproduction are considered. The species' resistance to salinity and drought, ecological adaptability and importance in the tugai ecosystem are emphasized.

**Keywords:** *vegetation period, shoot, leaves, stem, bud, swelling seeds, flower, peduncle, root system, vegetative reproduction, stamen, flowering*

#### Introduction

Poplars belong to the genus *Populus* L. of the *Salicaceae* family (Korovin O. N., Bakhiyev A. B., Tadjitdinov M. T., Sarybayev B.Sh., 1982. 23 p.). This genus includes 17 species in Uzbekistan, and four species of poplars are found in Karakalpakstan. The main and most stable representative of woody plants in the forests of the territory of Karakalpakstan is the poplar tree.

In the recent works of several authors of the "Central Asian Works Guide" for Karakalpakstan, the species of poplar *P. pruinosa* and *P. euphratica* are indicated, main-

ly in our flora *P. pruinosa* and *P. ariana* grow (Bakhiyev A. B., 1974, p. 239–243).

*Populus pruinosa* has lanceolate, oval, velvety leaves. Branch leaves are bud-shaped, with 3–7 slightly curved teeth, uniformly bluish-green on both sides, smooth, and slightly wrinkled on the petioles. The male catkins are drooping or slanted upwards, bright reddish-brown in color, while the female catkins are egg-shaped and yellow. Its range corresponds to *P. diversifolia* in the north and *P. ariana* in the south. The tree reaches a height of up to 18 meters and a diameter of 80–90 cm. The tip of the tree is

wide, sharp, up to 10 in diameter. The shell is initially brown, green, then yellowish-gray, with deep cracks. Branches are round, green or gray. The shape of the leaf blade changes with age, but the diversity of colors is less noticeable than in other species. The leaf is 3.5 cm long and 4 cm wide, broad, bud-shaped or round, with a wedge-shaped base and 3–7 barely noticeable teeth. It is bluish, hard, and dew-shaped on both sides. The stem length of the branches is 2.1 cm, and they are very wrinkled from the sides. Annual branches are round, crooked, with green, reddish, gray, dew-like, and drooping bark.

The vegetative buds are 7 mm long, elongated, attached to the branch, and brown. The leaves of annual branches are 6–9 cm long and 3–7 cm wide, ovate, with a slightly wedge-shaped and pointed base. The leaf stalks are 1 cm long and curved from the sides. Male flower buds are 12–13 mm long. The inflorescences are 4–5 cm long and 1–1.5 cm thick. They are cylindrical, reddish-brown, multi-flowered (26–50), and have a white-haired stem. Flowers on a hairy stem are up to 1 mm long. The inside of the flower is cellular, lanceolate, uneven, with sharp teeth. There are 15–31 stamens, slightly longer than the outside of the flower. The stamens are oval, up to 2 mm long, and the stamen stem is 1.5 mm long and reddish-brown.

The flower is plate-shaped, with toothed edges. Female flower buds are 10–12 mm long, oval, with a convex or flat surface, a rounded or slightly pointed tip, attached to the branch, and brownish-yellow in color. Egg-like. There are 20–35 flowers on a yellowish-green, 1 cm long hairy stalk. The inflorescence is cellular, lanceolate, with irregular teeth or smooth. The flower surface is plate-shaped, tuberous, and the stigma is yellow. The tubers are 10–11 mm long and attached to 1.5–5 mm long stalks. They are egg-shaped, with seeds 0.8–0.9 mm long

and 0.1–0.5 mm thick. The length of the egg-shaped, yellow or gray, yellowish hairs is 5.5 times longer than the length of the seeds. The tree is white, the kernel is yellow, hard. The root is taproot, strongly branched. The root is soft and brown. The shell is gray. Geographic distribution floodplains of the Syr Darya, Amu Darya, Murghab, and Tedjen rivers. In Karakalpakstan, *Populus pruinosa* is found in Nurimtubek, Baday forest, Esbergen inlet, Samanbay forest, Shortanbay forest, Shagal forest and in irrigation canals between villages.

### Material and Methods

Phenology of Poplar observations were conducted on a 10–15-year-old poplar tree in the botanical garden. Furthermore, observations were conducted on the poplars in the Shagal grove and around the city of Nukus. Baday, Bekboy, Nazarxon, Shoqay, Nurim, and other forests were visited (Gladysheva A. I., 1967, 22 p).

During our research period (2023–2025), the budding of the *P. pruinosa* species under study continued from the second decade of March and the first decade of April until the third decade of November. The beginning of the growing season depends on the air temperature. The earliest germination was observed in 2023, with an average air temperature of +6, 10. In the studied species *P. pruinosa*, germination occurs later than in *P. ariana*.

### Results and Discussion

The autumn coloring and change in leaf color of the studied poplar species began at the end of September. Under the same soil and climatic conditions, this process begins later in *P. pruinosa* than in *P. ariana*. Defoliation begins in late October and early November. In this process, *P. ariana* begins early, while *P. pruinosa* is the last. During the research years, the defoliation period lasted 25–31 days. However, this period can change every year (table 1).

**Table 1.** Phenological observation of species

Observation date	The results of observation
March 25	Beginning of vegetation. The bud began to sprout, and the buds began to open.
April 9	The plants have started budding. A green cone of leaves appeared.
April 14	The first flowers opened, or the branches began to sprout.

Observation date	The results of observation
April 19	Complete plant. More than half of the flowers or the tips of the branches have sprouted. Flowers have bloomed (less than half of the flowers remained).
April 20	A green cone of leaves appeared. The leaves are small, just beginning to emerge from the buds on the branch. The plant has bloomed.
April 29	The branches are growing, only unripe buds are visible, the buds are green, like a hump.
May 14	The leaves have reached normal size, but they haven't fully developed yet.
May 24	The branches hardened, except for the growing tips.
May 29	The leaves have grown, but haven't reached normal size. The buds are green, small, and have scales.
June 8	A bud at the tip of the branch has appeared, but it doesn't grow. Most leaves have fully grown, and there are still young leaves at the tips of the branches. The buds are green.
June 23	The branches have reached normal size, and the scales are green.
July 3	The branch has stopped growing lengthwise, a bud has appeared at the tip, the branch has not yet hardened and is not fully covered with tissue. All the leaves have reached normal size. They will last until July 28th.
August 2	The branch has hardened and is covered with fabric. The buds reach normal size, the scales harden, and continue until September 25th.
November 30	The plant is leafless.

**Flowering.** The buds of *P. pruinosa* are arranged alternately on the branches, adhering to the branch, with a number of 5–13. Generative budding occurs in July on the *P. pruinosa* willow tree under study. The male flower buds of *P. pruinosa* are fully formed by July 25<sup>th</sup>, while the female flower buds are fully formed by July 25<sup>th</sup>.

Also, the size of the flower buds is 3 mm long and 2 mm wide. Flower buds emerge and develop on the branches of this year and differentiate until the beginning of the next year's vegetation. Thus, the flower buds are always biennial.

The bud consists mainly of three layers, reddish-yellow in color, measuring 12 mm in length and 4.5 mm in width. The first outer shell covers the surface of the bud. It is pinkish-white, 4 mm long and 4 mm wide, and has teeth. The inner surface is sticky, reddish-black, and contains a sticky substance. The base of the bud is hairy, the tip is split in two, and the cortex is convex. The second shell is 10 mm long and 4.4 mm wide, shiny, light yellow, red, with a greenish-white base. The third shell is 10 mm long and

3.5 mm wide, elongated, pinkish, and covered with a light yellow thin film on the outside.

Flower pollen. In 2020–23, the flower pollen length was 11 mm, cylindrical, sharp, reddish-black, with light red hairs on the outside, two petals, reddish-green, with a light-colored, hairy stem. Two types of willow buds differ from each other. The male flower structure consists of stamens, numbering 31–53 on each flower. The number of flowers in the pollen is 31–48 (Bakiyev A., Qaniyazov S. K., 2003). The female flower has only a pistil, similar in shape to the pistil of the *P. ariana* species. Under favorable weather conditions, *P. pruinosa*'s flower buds begin to fully open within a week. From the very first day of blooming, it can be seen that all the flowers in the pollen are female flowers. 5–6 unevenly developed flowers appear, located at the base of the branch and larger than those at the tip. They bloom 2–3 days after the flower buds open. The earliest flowering was observed in 2023 (April 3). The air temperature here was +11.70C, and the last flowering occurred on April 19, 2024 (+14.80). Seed ripening in *P. pruinosa* is observed 105–120 days after bearing fruit.

The ripening of poplar seeds in moist soil is prolonged, and the seeds are larger, while in dry areas, the seeds ripen faster. *P. pruinosa* seeds are shown. The *P. pruinosa* poplar begins to bud in late March and early April. In 2023, *P. pruinosa* poplar began budding on March 20th at an average air temperature of 8.10, with a maximum of 23.80, and a minimum of 5.20. The mass sprouting of the poplar occurred on April 10–15. The average air temperature was 10.20, maximum – 17.80, minimum – 5.50. Data on the growth of the studied species *P. pruinosa* are presented in Table 6. It is evident that the growth period and branch length of *P. pruinosa* are shorter than those of *P. ariana*. The strongest growth of 10–12 year old poplars occurs in May. During this period, 50% of the annual growth of all branches is ensured. The annual growth and growth of different branches on the same tree are different. They thrive on warm days – in spring and summer. With a decrease in air temperature, the growth rate also decreases.

**The proliferation of poplars.** *P. pruinosa* poplar, like *P. ariana*, reproduces from

seeds and vegetatively through branches and root cuttings.

**Seed Reproduction of Poplar.** Seed propagation of *P. pruinosa* occurs naturally and through artificial cultivation. Poplar seeds ripen in mid-August. The seeds are very small. Seeds ripen and scatter in 105–120 days. The process of seed propagation in nature coincides with the period when floods decrease and new shallows appear, where ripe seeds fall, and seedlings germinate from floating seeds. Vegetative reproduction of *P. pruinosa* poplar. We studied the vegetative reproduction biology of *P. pruinosa* poplar in the natural conditions of the Shagal woodland. The object of observation was *P. ariana*. In 2024, we conducted an experiment by planting branch cuttings. For this purpose, 100 branches with a length of 35–50 cm were cut and planted along the irrigation ditches (Table 2).

Therefore, the germination rate from the branch is very low. The most common type of reproduction is propagation through root branches.

**Table 2.** Data on poplar reproduction from root cuttings

Planted Year, Date	The number of planted cuttings	Sprouted in May	15 <sup>th</sup> June	Year 2024			Total of sprouted cuttings
				15 <sup>th</sup> July	15 <sup>th</sup> August	15 <sup>th</sup> September	
3 <sup>rd</sup> of March, 2024.	100	14	13	10	8	9	14%

Propagation through root branches mainly occurs in water-applied valleys. In the Baday Forest Reserve, 63 roots of the species *P. pruinosa*, ranging in length from 193 cm to 213 cm, were found on an area of 10 square metre.

Dense poplar forests grown from root branches can be found in the Amu Darya's water-applied valleys and along its banks. The root branches of *P. pruinosa* are also abundant in irrigated areas. As a result of propagation through root branches, the area of poplar forests expands.

### Conclusions

In conclusion, poplars are distinguished by their resistance to salinity, low humidity,

and cold. It is considered the most valuable material for green spaces in the spring months. Poplars can be propagated both by seed and vegetatively: through root buds and root cuttings.

In Karakalpakstan, due to the extensive development of land for rice and other agricultural crops, as well as the emergence of fires, the area of poplar forests has decreased. This situation occurred in the Bekboy, Shagal, and Nurim tubek forests. The forest is the wealth of the people, the golden treasure of every region. Therefore, preserving and protecting forest areas is our primary responsibility.

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