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MORPHOLOGY OF PINE POLLEN

Abstract: Morphology of pine pollen is the study of the shape, structure and size of the microscopic grains that are produced by pine trees for reproduction. Pine pollen is a type of gymnosperm pollen, which means it has a single opening (aperture) and a thick outer wall (exine). Pine pollen can be classified into different types based on the number, position and shape of the apertures, as well as the ornamentation and sculpturing of the exine. Morphology of pine pollen is important for understanding the evolution, diversity and ecology of pine species and their interactions with pollinators and the environment.

Key words: pine, morphological, pollen, grain, parameters, produced, male, structure

Pine pollen is the male gamete of the pine tree, which belongs to the family Pinaceae. Pine pollen grains have a distinctive morphology, characterized by two wing-like air sacs on either side of the grain. These air sacs help the pollen to disperse by wind over long distances. The pollen grain also contains a large tube cell, which will grow a pollen tube after landing on a female cone, and a small generative cell, which will divide into two sperm cells. Additionally, there are two prothallial cells, which are remnants of the male gametophyte. Pine pollen is produced in male cones, or microstrobili, which are clusters of microsporophylls with two pollen sacs each. The pollen is released in spring or early summer, when the male cones turn yellow and open up.

The high ecological plasticity and polymorphism of the Scots pine (*Pinus sylvestris* L.) caused the emergence of a large number of forms, races and varieties in the pre-cases of the species range. In hydromorphic ecosystems, pine populations are represented by swamp forms adapted to the pessimal regimes of the main environmental factors - temperature, hydrological, edaphic. A significant role in the

formation of swamp populations of pine is played by phenological isolation in terms of dusting from dry stands. Data on the peculiarities of the development of male generative structures of the common pine in hydromorphic localities are few. In 1991-1998, route studies of the structure of populations of Scots pine by the color of microstrobiles were carried out. Differentiation into yellow- and red-pollen forms (with different color intensity) was carried out by the presence or absence of anthocyanins in them, according to the recommendations of G.M. Kozubov. The sample size was approximately 2500 trees on oligotrophic swamps, 900 on eutrophic and 1200 on dry forests.

The production-physiological and morphological parameters of Scots pine pollen were studied in various parts of the species range. In general, the variability of pollen parameters for the species remains low both at endogenous and intrapopulation levels. Data on the features of the structure and the size of pollen in swamp populations of pine are few and cover only the European part of its range. At the same time, there were no significant differences in pollen sizes between swamp and dry pine populations. At the same time, there is a higher viability of pollen in pine trees in the swamp compared to dry woods. The peculiarity of the male generative sphere of the scots pine in low-temperature conditions of swamp ecotopes is a significantly higher proportion of the red-pollen form compared to the dry land. A decrease in the linear size of microstrobiles and the number of microsporophylls in pine trees in oligotrophic swamps probably provides accelerated and "economical" development of male generative structures in trophic limiting conditions. Pine trees in swamps have an increase in the size of pollen grains compared to trees on dry land. The sizes of microstrobiles and the number of Microsporophylls in the red-pollen pine are significantly lower than in the yellow-pollen pine. At the same time, this feature does not have a noticeable effect on the size of the pollen grains forming. It is obvious that the mold differentiation of scots pine by the color of microstrobiles, which optimizes the process of microsporogenesis at low temperatures, does not apply to such species-specific parameters as the size of pollen grains.

Conclusion: Morphology of pine pollen is an important topic in botany, ecology and paleontology. Pine pollen grains have a distinctive shape and structure, with two or three air sacs attached to the main body. These sacs help the pollen to disperse in the wind and increase its chances of reaching a female cone. The morphology of pine pollen can also provide clues about the evolutionary history and environmental conditions of pine trees and their relatives.

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