SibFU scientists told how Siberian pine adapts to climate change

Scientists from the School of Ecology and Geography of Siberian Federal University conducted a study to define indicators that allow identifying individual characteristics of Siberian pine trees — due to these features, trees manage to remain viable in the most adverse conditions, maintain frost resistance with a temporary increase in temperature in winter and resistance to emerging water scarcity.

In the context of global climate change, the problem of adaptation of plants to adverse environmental factors is gaining relevance. Many species of coniferous trees are beginning to change the established boundaries of their range. The southern border of coniferous forests is shifting due to a decrease in humidity, and the northern (upper) border is changing its contour due to a noticeable increase in temperature in recent years. Scientists believe that these processes reduce the ability of forests to effectively absorb carbon, and this can provoke an increase in the greenhouse effect.

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It is known that cedar "helps" the spread of Siberian pine by spreading seeds and burying them in moss and underlays. Many of these seeds subsequently germinate, but only a small percentage of seedlings become mature trees. At the same time, the proportion of such "lucky ones" under the canopy of the forest is much higher than in the open area. Therefore, it is important to understand what features of these specimens allow them to survive in the harsh conditions of the mountains.

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To find out the adaptive potential of a particular coniferous species to climate change, scientists considered the functional characteristics of the needles of the Siberian pine (Pinus sibirica du Tour), growing in the area of the Ergaki Natural Park on the Western Sayan.

In the spring months and in the middle of summer, the members of the scientific team collected shoots of Siberian pine at different heights above sea level for subsequent determination of the depth of winter rest, the pigment composition of needles and other physiological and biochemical parameters. The first results have already been obtained.

Among the model trees from four sample areas located at different heights above sea level (and the two upper sections are above the forest boundary), scientists selected specimens with minimum and maximum chlorophyll fluorescence indices. It was confirmed that these indicators are closely related to the characteristics of the pigment composition and the weight of the needles. According to many researchers, chlorophyll fluorescence is a promising method for elucidating the phenotype of plants. Thus, it will be possible to identify the most stress-resistant and productive pine specimens that can survive in the most extreme conditions above the current upper forest boundary and become the basis for the formation of forest ecosystems in these regions.

It is likely that the data obtained by the scientific team of the School of Ecology and Geography of Siberian Federal University on the upper border of the forest in conditions of high-altitude zonation will be correct in the latitudinal direction for the northern border of the range.

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