

Comparison of the Ecophysiological Parameters of Pine and Spruce in the Serebryanoborsky Experimental Forest District

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Research conducted in Serebryanoborsky forestry Institute of Forestry RAS. To evaluate gas exchange, an original setup based on an infrared gas analyzer was used. The installation created at the Forestry Institute of the Russian Academy of Sciences made it possible to simultaneously, round-the-clock receive daily changes in the intensity of photosynthesis and respiration of adult trunks of pine and spruce trees. It was found that the respiration of pine and spruce trunks, calculated on the surface of trunks, does not differ significantly, while the intensity of photosynthesis of spruce (when calculated on the surface area of needles) is almost two times lower than that of pine. However, we believe that when calculating the area of growth, the differences will be insignificant, since the mass of spruce needles in the stand is much greater than the mass of pine needles per unit area of growth. It was found that the intensity of photosynthesis of spruce is more affected by moisture deficiency. So, during the day, with a PVPL equal to -0.8 MPa, on a cloudy day from 9 o'clock it reduces the intensity of photosynthesis, whereas in pine only after 12 hours. On cloudy days, spruce with the same water supply practically does not decrease the intensity of photosynthesis during the whole day, and differences in the light curves of photosynthesis of pine and spruce are less significant. The calculation of pine and spruce trunk respiration per day depends on the arrival of solar radiation; on cloudy days, the respiration rate is two times weaker than on low-cloud days.

Thus, environmental and physiological indicators reflect the state of stands. The most informative indicator is the predawn water potential of the leaf (needles). This indicator characterizes the water availability of the tree, regardless of the reason for the decrease in water availability. The daily course of photosynthesis intensity and CO_2 emission from the surface of the trunks are also informative indicators of the state of trees. However, when comparing different breeds by shade tolerance, it is better to use breathing from the surface of the trunks.