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Physiological Studies of Woody Plants

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The Laboratory of Plant Physiology was founded at the Forest Institute in 1944 under the supervision of a member of correspondent USSR Academy of Sciences L.A. Ivanova.

During this time, the laboratory studied the water, light conditions and carbon balance of the forest in different forest zones. The dependence of the number and spectral composition of PARs under the forest canopy on the throughput of the canopy of the forest stand was investigated. The physiological mechanism of drought tolerance of trees in the steppe zone has been studied. It has been shown that there are various ways of adapting tree species to drought. The joint existence of species with different types of adaptation of trees to arid conditions (for example, oak, fluffy ash and small-leaved elm) reduces the life of plantings. Artificial shading studied the effect of light deficiency on growth, leaf anatomy and carbon metabolism in seedlings of different species and revealed a physiological mechanism shade tolerance. The intensity of the processes of carbon metabolism – photosynthesis and respiration of various organs of trees (leaves, branches of different ages, trunk, growth and sucking roots) and their dependence on external conditions were studied. The carbon balance of individual leaves, branches, trees and stands was calculated under different weather conditions. The crown structure of several tree species was studied, the carbon balance of branches of different ages, and their lifespan. A mathematical model of the carbon balance of different species is constructed, and on this basis the possibility of the existence of a forest depending on the climate is calculated.

Ecological and physiological studies were conducted (root respiration and photosynthesis of pine and birch). A methodology has been developed for assessing photosynthetic productivity based on the dependence of the efficiency of the use of absorbed solar radiation on the photosynthesis of covered or leafy shoots and the absorption of solar radiation by the canopy. It was found that forestry and photosynthetic productivity differ only slightly in these methods. It was found that the stands of pine and birch growing in optimal forest conditions have almost the same productivity.

Estimates of the effect of moisture deficiency in seedlings of tree species under the canopy of wood stand.