

FEATURES OF UNDERGROWTH DEVELOPMENT IN EASTERN EUROPEAN FORESTS

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Abstract. We studied the development of 13 tree species growing in the undergrowth of hornbeam forests in the Kanev Reserve in Cherkasy Oblast (Ukraine) and spruce-broadleaved and pine forests in the Bryansk Forest Reserve (Russia). We analysed the following biological features of these species in limited light conditions: age, average annual increase in biomass (production), growth patterns of the aboveground axis, crown area, specific density of the leaf area and the ability to change to a quasi-senile state. Analysis of these biological properties allowed us to distinguish two large groups of species, which are characterized by a set of interrelated features. The first group included *Betula pendula*, *Pinus sylvestris*, *Populus tremula*, *Quercus robur* and *Salix caprea*. For these species, low shade tolerance is combined with rapid development, high intensity in growth and physiological processes (photosynthesis and respiration), with large average annual biomass increase and short lifespan when growing in the undergrowth due to a lack of light. This set of features allows the trees to occupy habitats with good light conditions, which are found in large-sized treefall gaps as well as sparse forests. The second group included *Acer campestre*, *A. platanoides*, *A. tataricum*, *Carpinus betulus*, *Fraxinus excelsior*, *Picea abies*, *Tilia cordata* and *Ulmus glabra*. For these species, high shade tolerance is combined with slow growth rates, with a low intensity of growth and physiological processes, with small average annual biomass increase and long-term existence of individuals in limited light conditions. Species with this complex of features are adapted to habitats beneath a dark forest canopy formed by spruce and broadleaved trees with crowns that cast deep shadow. These large species groups appear in the vegetation cover as complementary formations and form contrasting communities. Tree species within each group determine the resilience of forest communities as they are able to replace each other in the event of a reduction in the number of individuals of any species. The basis of this ability is the congeniality of species according to their light requirements and biological properties.

Keywords: East European forests, tree ontogeny, biological age of plants, light minimum for undergrowth, shade tolerance of undergrowth, scales of shade tolerance, undergrowth productivity, age of undergrowth.